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**CONSTRUCTION EVALUATION
OF
POND 3A AND POND 1A/1B**

Attachment S

Information request #14



STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

March 12, 1990
SRK Project No. 22201

Hecla Mining Company
6500 Mineral Drive
Box C-8000
Couer D'Alene, Idaho 83814

Attention: Mr. Larry Drew

RE: CONSTRUCTION EVALUATION OF POND 3A AND POND 1A/1B

Dear Mr. Drew,

Enclosed for your review please find one copy of the construction evaluation of Pond 3A and Pond 1A/1B for the Hecla/Apex Project in St. George, Utah. In addition to the report, I attached 3 separate draft as-built drawings. The first drawing contains an incisive detail of Pond 3A and 1A/1B locations at the mine site, the second a cross section explaining the constructive elements of the leak detection sumps and the increased depth of the Pond 1A/1B. Finally, the third is an in-depth panel layout of both primary and secondary lining systems, as well as the destructive seam sample locations.

I hope that you find all the enclosed material is to your satisfaction. I have taken the liberty of sending two additional copies of the report to the Hecla/Apex site. If you have any questions, please don't hesitate to call me at the number listed below.

Sincerely,

STEFFEN ROBERTSON AND KIRSTEN
(U.S.), INC.

Michael J. Hlinko
Environmental Services
and Solutions

MJH/b1

Enclosure

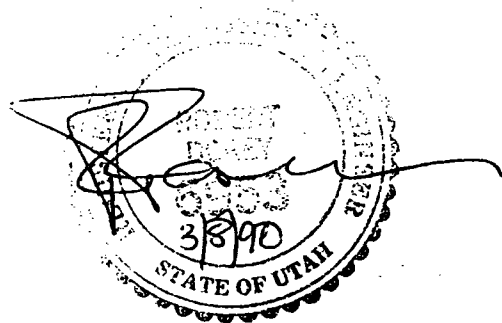
**CONSTRUCTION EVALUATION
OF
POND 3A AND POND 1A/1B
APEX PROJECT, ST. GEORGE, UTAH**

**Prepared for:
Hecla Mining Company
6500 Mineral Drive
Box C - 8000
Coeur D'Alene, Idaho 83814**

**Prepared by:
Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street
Lakewood, Colorado 80227**

**March, 1990
SRK Project No. 22201**

The report "Construction Evaluation of Pond 3A and Pond 1A/1B" prepared by Steffen Robertson & Kirsten (U.S.), Inc. under the direction of Rob Dorey, Utah Registered Professional Engineer #6953, documents the construction quality assurance and control activities performed at Hecla Mining Company's Apex Unit near St. George Utah. Based upon the periodic observation and discrete materials testing documented in this report, to the best of our knowledge, the work has been constructed to the detail and intent of the design and specifications.



Rob Dorey
#040175

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1.0 INTRODUCTION

1.1 Scope of Work

This report describes the re-construction of two lined ponds for Hecla Mining Company's Apex Unit, near St. George, Utah. The general layout of the facilities is shown on the attached as-built drawings.

The scope of work included removal of historic process waste materials in existing ponds, regarding and enlarging capacities of one pond, find grading and compacting sub-grades, installation of two 60 mil-HDPE liners, construction of leak detection sumps in each pond with an attached geonet flow enhancer between the primary and secondary liners and leak detection systems; and the construction of liner anchor trenches.

All earthwork for excavation and construction was performed by Rogers Construction Company of St. George, Utah. Installation of the synthetic liners was performed by Crest Liners, Inc., Salt Lake City, Utah. Some survey services were provided by Hecla Mining Company or their contractors.

The following is a summary of starting and completion dates or earthwork and liner work for the project:

Pond 3A Earthwork

Removal of the historic process wastes and the existing 40 mil liner began on approximately August 22, 1989. The rough excavation for Pond 3A was completed on September 26, 1989. Fine grained soils were placed during the period of September 27 through October 9, 1989. The pond was ready for liner on October 9, 1989.

Pond 3A Liner Work

Repair work on the existing 40 mil liner on the ponds slopes began on September 21, 1989. This repair work continued on and off until October 17, 1989 at which time the decision was made to reline the pond slopes with new 60 mil HDPE liner. Deployment of the secondary liner began on October 20, 1989 and continued until December 12, 1989 at which time work was switched to Pond 1AB. On December 28, 1989 repair work continued on Pond 3A. Deployment continued on January 3, 1990 and continued through January 29, 1990. Liner work on Pond 3A completed on January 28, 1990.

Pond 1A/1B Earthwork

Removal of the existing liner in Pond 1B began on September 22, 1989. Excavation of the proposed Pond 1AB began on October 9, 1989 and continued through November 2, 1989. Fine grained soil placement within the pond began on November 2, 1989 and continued through November 6, 1989. Some minor hand cleanup work was required prior to liner deployment.

Pond 1A/1B Liner Work

Deployment of synthetic materials began on December 12, 1989 and continued through December 31, 1989. All materials had been deployed by December 31, 1989. The sump on Pond 1AB was repaired on January 29, 1990, which completed all work.

During the construction of the new ponds, several days were lost due to foul weather - rain, snow or high winds.

The design of the solution ponds was prepared by Steffen Robertson and Kirsten (U.S.), Inc. The technical

specifications for the work are contained in the August 1989 report are titled "Technical Specifications Pond Systems, Apex Project, Utah." (See Appendix G). The construction as-built drawing package consists of the following drawings.

22201-01	As-built existing ponds 1A/1B, 3A	C
22201-02	As-built sections & details	C
22201-05	As-built liner panel layout plan	A
	Ponds 1A/1B & 3A	

As-built drawings of this construction phase, Pond 3A and Pond 1A/1B, are presented under a separate cover to this report.

1.2 Pre-Construction Overview

Initially it was intentioned to utilize the 40 mil HDPE in pond 3A as the secondary geomembrane in the double lined system. To achieve this it was imperative that the crystalline material within the pond be removed. Once the slurried process waste was removed, the existing 40 mil HDPE geomembrane was to be cleaned using a high pressure wash and then visually inspected.

Several attempts were made to dissolve the waste which proved unsuccessful. The 40 mil HDPE was then cut above the waste level and excavated with the waste. Removal of the existing 40 mil HDPE and re-work of the subgrade at the same time removing any contaminated soil and replacing it with clean approved material was performed. Both the floor and slopes were re-worked and made ready for the double lined system. See Section 2.0.

Ponds 1A and 1B were to be combined removing the separation to increase pond capacity for Ponds 1A/1B. With the removal of the

existing liner material (Gillsabind), the depth of the ponds were increased to 15 feet, continuing with an internal pond slope at 3:1.

2.0 PONDS 1A/1B AND 3A

2.1 General

Pond 1A/1B was created from two existing shallow ponds designated 1-A and 1-B. The berm between the existing ponds was excavated, the Gillsabind liner in pond 1-B was removed as well as the underlying soils. The depth of the new pond was 15 ft. Once the rough excavation had been completed, the sub-grade materials were worked to remove cobbles and larger gravel materials. Fine grained soils were placed and worked into all subgrade material which would receive synthetic liner. These materials were placed and tested in accordance with the project specifications. Test results are presented in Appendix A. The entire sub-grade including the retention berm is covered with two layers of 60-mil HDPE synthetic liner and leak detection geonet. The foundation was prepared in accordance with the project specifications. (See Appendix G).

Prior to any geomembrane installation the engineer was in receipt of the manufacture's quality control certificates. (See Appendix C). As a precautionary measure, SRK required additional geomembrane (60 mil HDPE) conformance testing to be done by an independent third party laboratory. Samples were taken by the field engineer who randomly selected conformance samples from every 100,000 sq ft of on-site material. The conformance test results for National Seal Co. all passed. (See Appendix D).

A 28-ft, average width, retention berm, which consists of an existing bench excavated on the surrounding slopes and fills placed in low areas, enclosed the perimeter of the 1A/1B pond. The crest of the retention berm is sloped away from the pond to the northeast, northwest, and southwest, a drainage channel has been excavated to prevent surface water flows from entering the pond.

Pond 3A was created from a previously lined pond designated 3-A. No changes in the lines or grades were made to the slopes, however, the bottom was regraded after contaminated materials were removed, to lines and grades shown on the as-built drawings attached. Once the rough excavation had been completed, the sub-grade materials were worked to remove cobbles and larger gravel materials. Fine grained soils were placed and worked into all sub-grade material which would receive synthetic liner. These materials were placed and tested in accordance with the project specifications. Portions of the pond's previously constructed 40-mil liner were left in place on the slopes for additional protection of the new 60-mil liners.

A 16-ft, average width, retention berm, which consists of an existing bench, encloses the perimeter of the 3-A pond. The crest of the retention berm is sloped away from the pond to prevent surface water flows from entering the pond. To the southwest, the berm is common with existing ponds 3-B north and south.

2.2 Stripping

No stripping was necessary, within the construction limit of the new ponds.

2.3 Excavation and Fill Placement

The pond excavations were made with a D9H dozer, a 950B front end loader, and a 651-B scraper, to the lines and grades as specified.

The pond excavations were graded with a JDG7D-A Motor Grader and compacted after appropriate moisture conditioning with a BW213AD smooth drum compactor.

The cobbly foundation was scarified to remove oversize materials to a depth of 12 inches. Three to four inches of a pre-moistened silt, borrowed from an on site pit adjacent to and northwest of the pond 1A/1B, was placed in one lift, and rolled with a smooth drum roller to an acceptable surface condition in preparation for the deployment of the synthetic liner. Evaluation of fill placement was by visual observation and testing by sand cone method ASTM D-1556. A summary of test results is enclosed in Appendix A. All daily reports for the project are on file at the project site and in SRKs Denver office. Additional copies are available upon request.

2.4 Geomembrane

A Geomembrane (60-mil HDPE) synthetic liner, manufactured by National Seal Company (NSC), was placed over the prepared surface of the pond and geo-cloth at the credit of slopes by Crest Liners, Inc. Installation of the liner began December 16, 1989.

Individual liner panels were 14.75 ft wide. Each panel was positioned on the prepared surface so that the factory and field seams were oriented parallel with the slopes.

2.5 Geomembrane QA

Seaming was by fusion welding. Patches and other abraided areas were ground to a rough texture and extrusion welded. All "T" joints were patched. The field engineer disqualified fusion welding on all "T" connection due to failing non-destructive testing. Samples were removed and sent to the designated third party laboratory for additional evaluation. Evidence of tunneling due to three layers of geomembrane at the connection caused the failing welds. (See Appendix F).

Fusion welds concentrate heat from a passing hot wedge. The Hot wedge makes the geomembrane semi-molten for pressure sealing between wheels. Having three layers passing through did not allow proper heat dispersion which caused seam failure. The field engineer required all "T" connections to be patched to rectify the problem.

A situation arose where Crestliners crew was using extrusion welding rod which appeared to be contaminated. The field engineer quickly rejected that roll and requested use of a newly delivered roll. A sample of the contaminated rod was sent to the third party testing laboratory for evaluation. Test results demonstrated acceptable properties, but the rod did demonstrate that the roll had been exposed to a soap liquid. (See Appendix D).

Prior to each day's seaming, trial seams were made on strips of liner material by the operators and their equipment which were to be used for the liner panel installation. Tests of the trial seams were conducted by the contractor with a field tensiometer. No seaming was performed by the welders until the trial tests passed. Destructive and non-destructive testing of seams and patches for water tightness was performed by the contractor and observed by SRK personnel. Testing of all welds was by vacuum method. A vacuum box equipped with a glass viewing window and a vacuum gauge was placed over the weld which had been prepared by mopping with a soap solution. A minimum of 5 psi of vacuum was applied to the box and the weld was then examined through the window for bubbles denoting leaks. Areas that were found to be leaking were marked, rewelded then rested until found to be water tight.

During a visual examination of seams, surfaces of panels and patches were marked for destructive testing (ASTM D-638 test method) and repairs due to holes and/or abrasions. The destructive tests were performed on dumbbells cut with the seam centrally located within the test specimen. Destructive test results are enclosed in

Appendix B. Prior to acceptance of the liner by SRK, each installed panel was visually examined for repairs and vacuum test acceptance. Suspect areas were re-patched or welded and vacuum tested until water tight integrity was proven.

3.0 GEO-DRAIN

3.1 General

A geo-drain, produced by Tensor Corp., Morrow, Georgia, designated NS1300, was installed by Crest-liners Corp., as a leak detection layer in the ponds between the two synthetic liners. The geodrain was placed so as to transport any collected solutions to the collection sump shown on the drawings.

3.2 Placement

The geodrain was carefully placed over the secondary liner. Slip-ties on three ft centers were used to join the geodrain seam to seam. No overlap of the geodrain was required.

4.0 HDPE PIPE (LEAK DETECTION MONITOR PIPE)

4.1 General

The eight-inch HDPE sump pipe was furnished by Hecla Mining Co. The pipe was fusion welded and placed in each sump to the lines and grades as shown on the as-built drawings.

4.2 Installation

The bottom six ft of pipe was drilled with 1/8 drill bit to allow solution access and 60-mil liner material was welded to the bottom for a plug. The bottom 6 ft was covered with geocloth to keep any silt from entering the perforations. The top section of the pipe was anchored by straps to a rough sheet placed loosely on the secondary liner and anchored in the anchor trench. Geonet was placed over the pipe prior to the securing of the primary liner. The geonet and primary liner were closely secured around the pipe with sand bags along the length of the pipe.

5.0 LEAK DETECTION SUMPS

5.1 Installation

The earth contractor completed the excavation and final grading prior to the placement of the secondary liner as shown on the as-built drawings. After the secondary liner was installed and approved, a "rough" sheet was placed on top of the secondary liner to protect the secondary liner from damage or possible abrasions caused by the sump rock placed on top and between the secondary and primary liners. To further protect the primary liner, geocloth covered the in place graded sump rock. Geonet was placed over the geo cloth, secured in place by slip ties and then the primary liner was deployed and seamed in place.

6.0 CONCLUSION

Based on the test results and the construction monitoring program conducted by SRK, it is our opinion that the 1989/1990 re-construction of ponds 1A/1B and 3-A was in compliance with plans and specifications dated August 1989 titled "Technical Specifications Pond Systems, Apex Project, Utah."

6.1 Quality Assurance Program

Steffen Robertson and Kirsten (U.S.), Inc. implemented a quality assurance program for HECLA Apex project which was designed to assume that all materials and placement of materials met the minimum requirements as set forth in the design drawings and specifications.

All test methods and procedures followed, were in strict conformance to industry standards for soils and geosynthetics testing and installation. The following are standards which we used: ASTM 1989, Section 4, Construction Volume 04.08 for soils and rock, ASTM D-35 for geosynthetics testing methods and standard NSF 54 for flexible membrane liners.

All SRK field personnel have gone through extensive training in all phases of earthwork and geosynthetic testing and installations. The following is a summary of work tasks which were observed, inspected and/or tested during the construction of ponds 1A/1B and 3A.

Earthwork

- Testing of materials to verify conformance with the project specifications prior to placement;

- Documentation, inspection and testing of all materials during placement; and
- Certification of foundation materials - assurance that the materials were compatible with geosynthetic materials.

Geosynthetic

- Inventory of delivered onsite material;
- Random select conformance testing (every 100,000²);
- Review quality control certification;
- Subgrade, proof rolled, acceptance;
- Visual inspection of panels during deployment;
- Trial weld testing/close observation during field seaming;
- Contact thermal observance (\pm°);
- Non-destructive testing documentation;
- Repair/re-testing inspection;
- Roll/panel/seam installation identification;
- Destructive testing evaluation (peel/shear); and
- Installation acceptance/sign off
 - Full capacity testing of leak detection sumps.

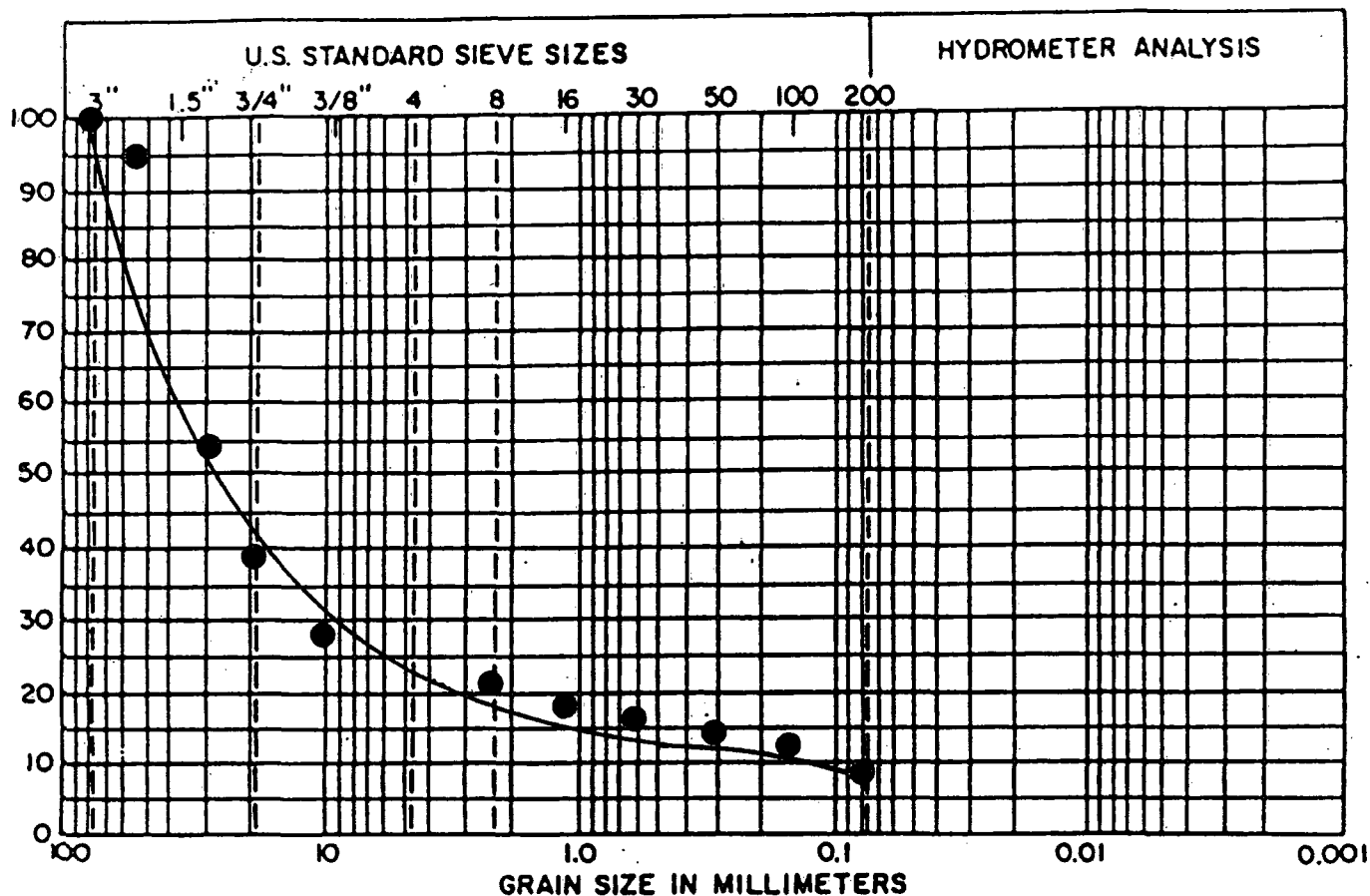
Summary of Appendices

Appendices to this report are listed below and follow this page:

APPENDIX A FILL PLACEMENT TEST RESULTS
APPENDIX B SITE ACCEPTANCE FORMS
APPENDIX C GEOMEMBRANE QUALITY CONTROL CERTIFICATION FOR POND 3A
& POND 1A/1B
APPENDIX D CONFORMANCE TEST RESULTS OF INSTALLED GEOMEMBRANE
APPENDIX E DESTRUCTIVE TEST RESULTS POND 3A AND POND 1A/1B
APPENDIX F "T" CONNECTION TEST RESULTS
APPENDIX G TECHNICAL SPECIFICATIONS POND SYSTEMS, APEX PROJECT UTAH

APPENDIX A
FILL PLACEMENT TEST RESULTS

GRAIN SIZE ANALYSIS



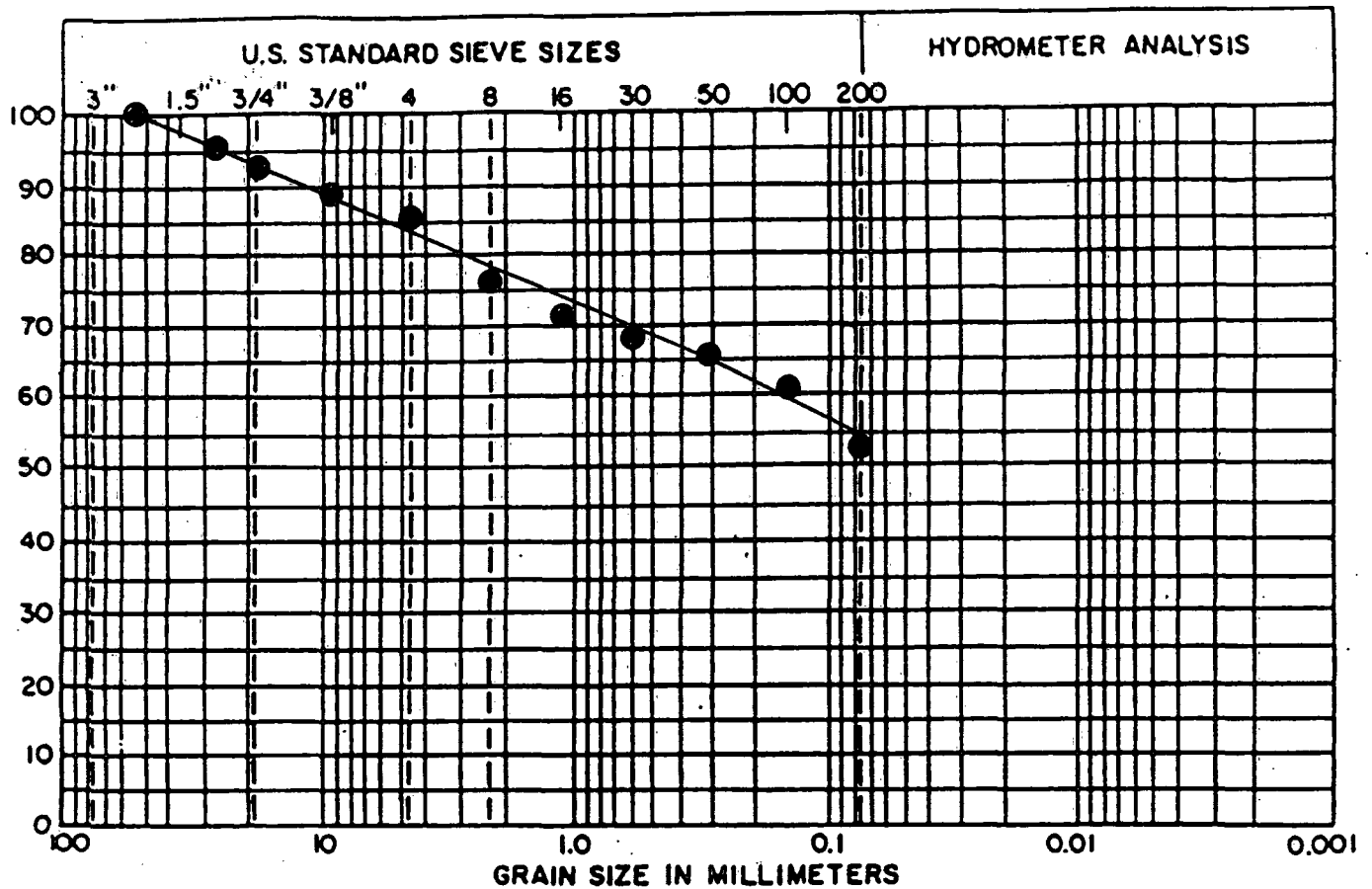
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

 LIQUID LIMIT --- PLASTICITY INDEX ---

 DESCRIPTION Gravel, sl. sandy, dense, dry, lt. gray USCS GM

	U.S. Sieve	Particle Size mm	Percent Finer		U.S. Sieve	Particle Size mm	Percent Finer		U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
					3/4"	19.00	39		30	.590	17	.019	
					3/8"	9.50	28		50	.297	15	.009	
3"	5.0"	126.7	100		4	4.750	25		100	.149	13	.005	
2"	3.0"	76.0	95		8	2.380	22		200	.074	9	.002	
1"	1.5"	38.0	54		16	1.190	19		—	.037		.001	

GRAIN SIZE ANALYSIS



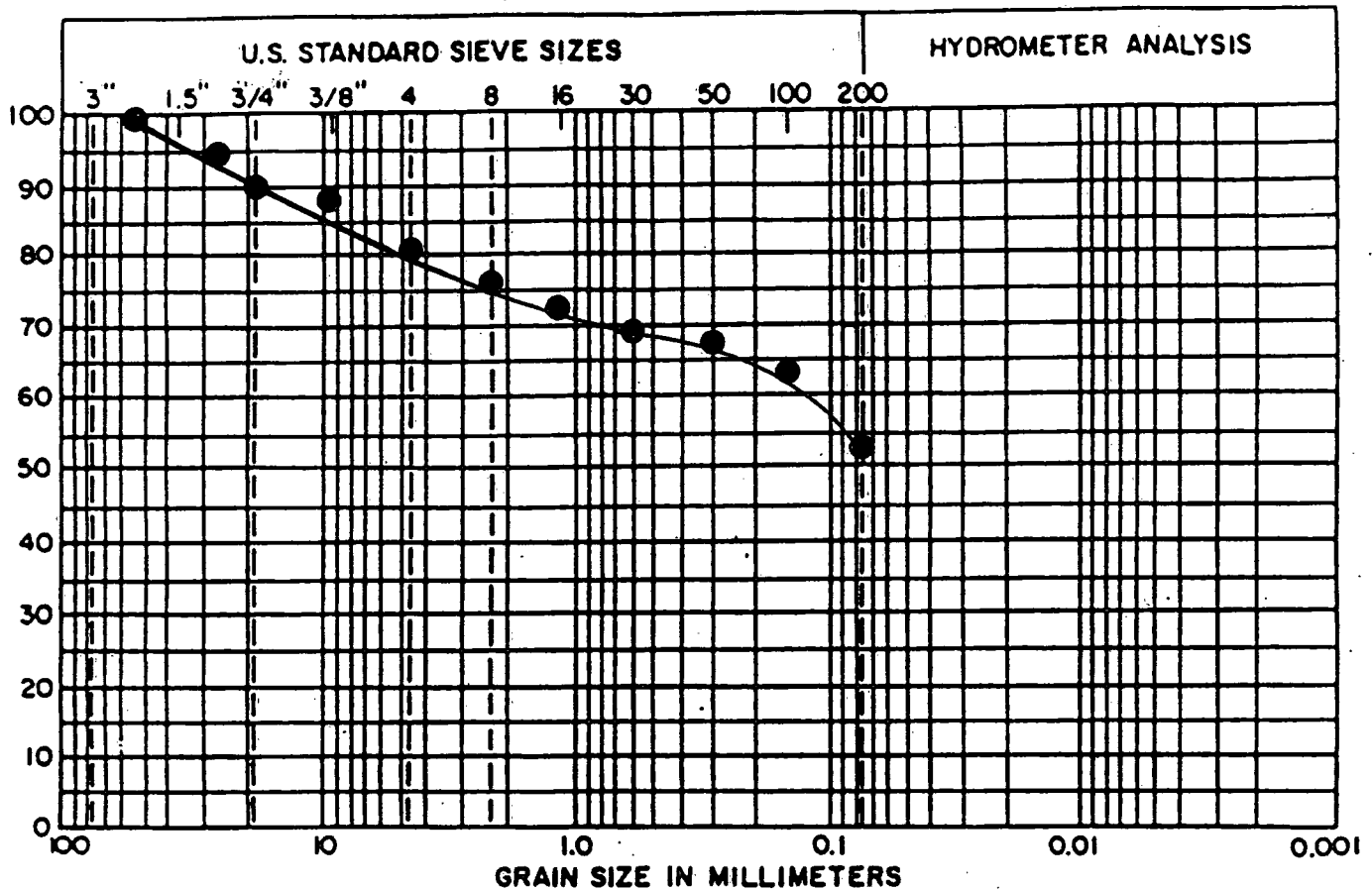
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

LIQUID LIMIT 21.4 PLASTICITY INDEX 4.2

DESCRIPTION Silt, sandy, sl. gravelly, dry, dense, red/brown USCS CL/ML

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	93	30	.590	69	.019	
			3/8"	9.50	89	50	.297	67	.009	
3"	.0"		4	4.750	87	100	.149	62	.005	
2"	.0"	100	8	2.380	76	200	.074	53	.002	
1"	1. "	96	16	1.190	72	—	.037		.001	

GRAIN SIZE ANALYSIS South Top Soil Stockpile



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

LIQUID LIMIT 22.1 PLASTICITY INDEX 2.1

DESCRIPTION Silt, sl. sandy, v. sl. gravelly, dry, USCS ML
dense, red/brown

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	90	30	.600	70	.019	
			3/8"	9.50	88	50	.297	68	.009	
3"	.0"		#4	4.750	82	100	.149	64	.005	
2"	.0"	100	#8	2.360	77	200	.074	53	.002	
1"	1. "	95	#16	1.190	73	—	.037		.001	

STEFFEN ROBERTSON & KIRSTEN

Consulting Engineers

LAB SRK Field

LAB NO. _____

CLIENT Hecla Mining Co.

PROJECT Apex Unit

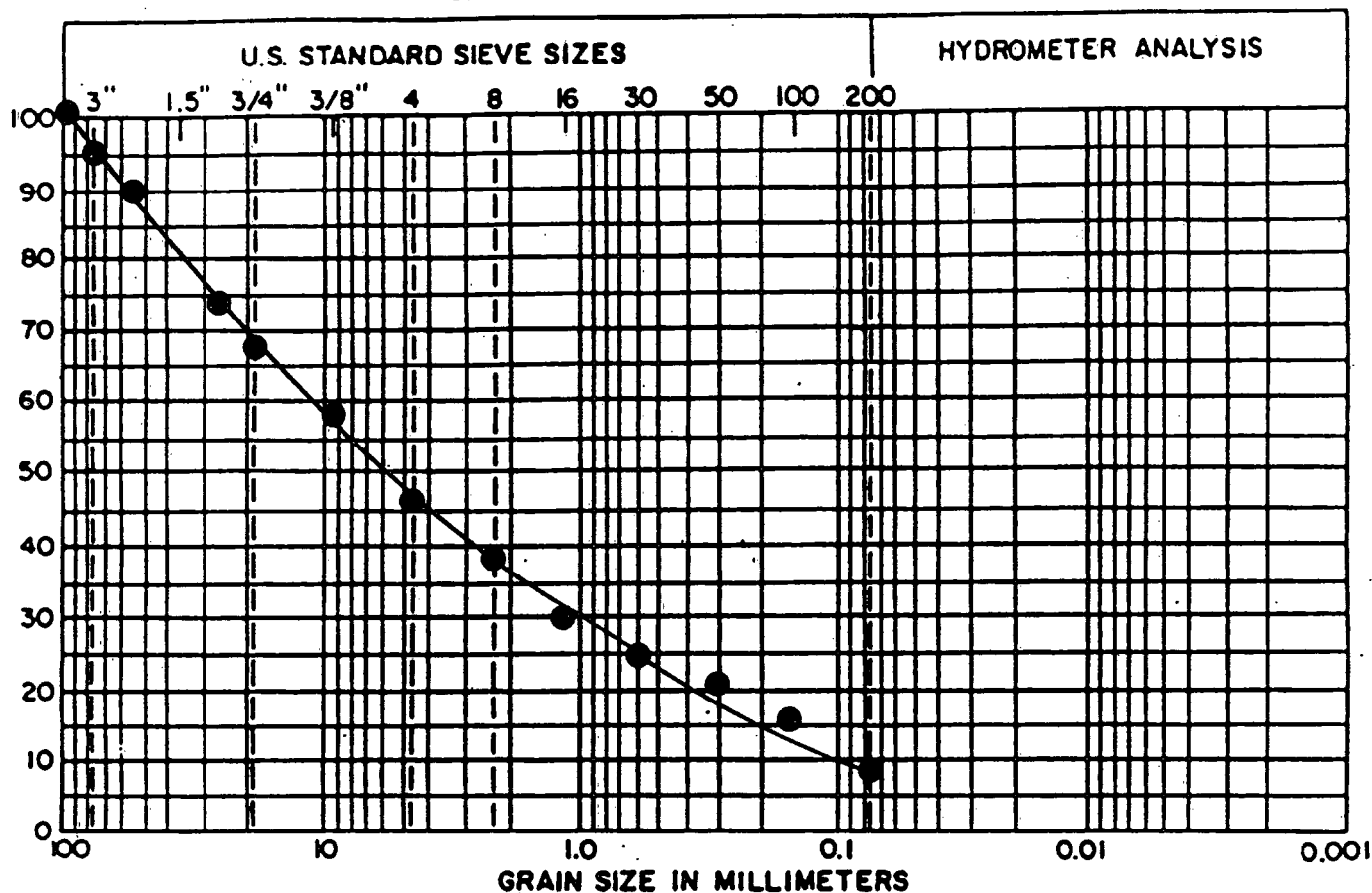
FEATURE Subgrade Pond3-A

PROJECT NO. 22201

SAMPLE NO. 5

DATE TESTED 9-20-89

GRAIN SIZE ANALYSIS



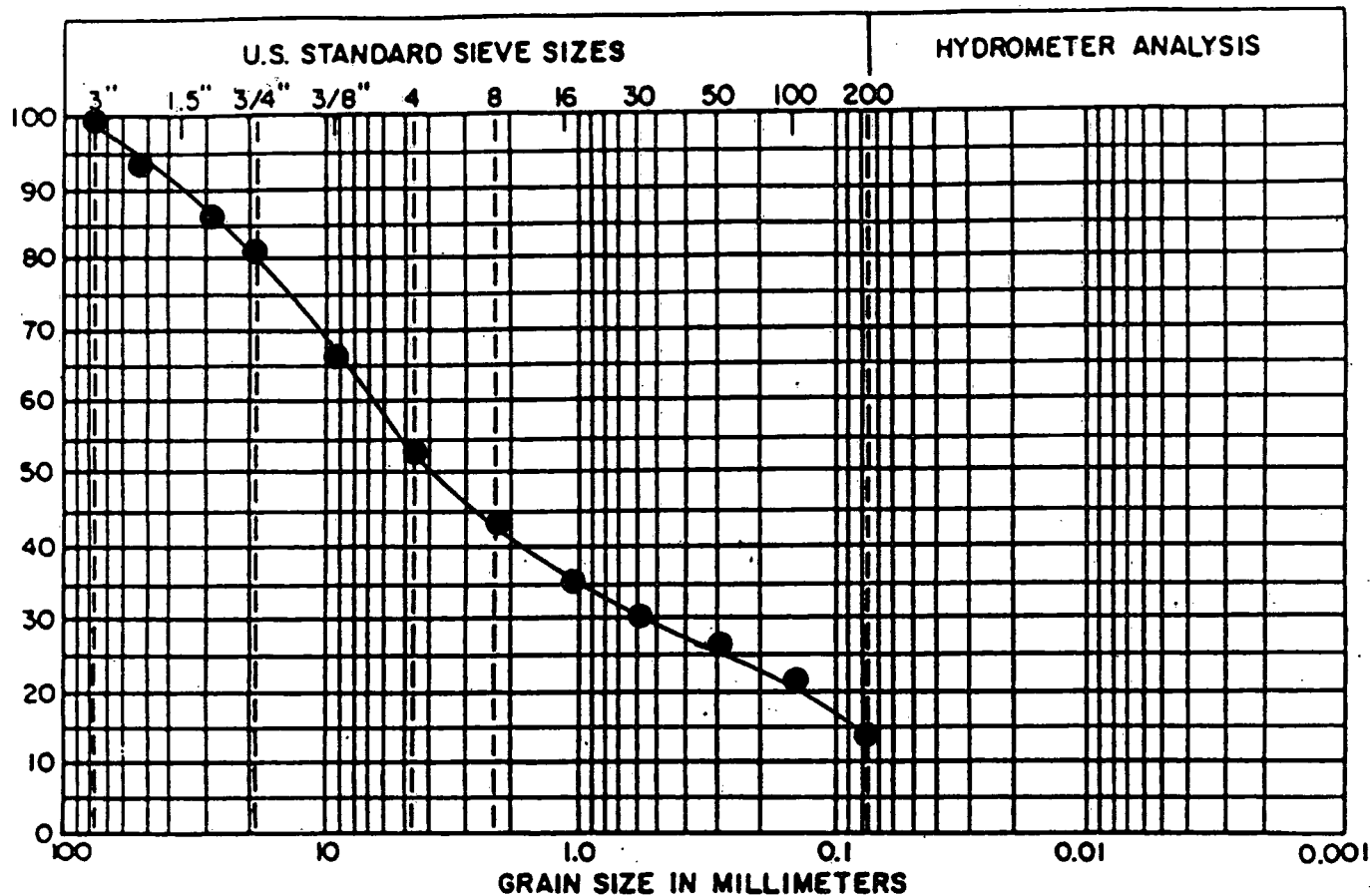
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

LIQUID LIMIT 10.1 PLASTICITY INDEX NP

DESCRIPTION Gravel with cobbles, sandy, sl. silty, dense, dry, lt. gray USCS GW

	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
				3/4"	19.00	67	30	.590	25	.019	
4"			100	3/8"	9.50	58	50	.297	21	.009	
3"	0"		95	4"	4.750	46	100	.149	17	.005	
2"	.0"		90	8"	2.380	38	200	.074	9	.002	
1"	1."		74	16"	1.190	30	—	.037		.001	

GRAIN SIZE ANALYSIS



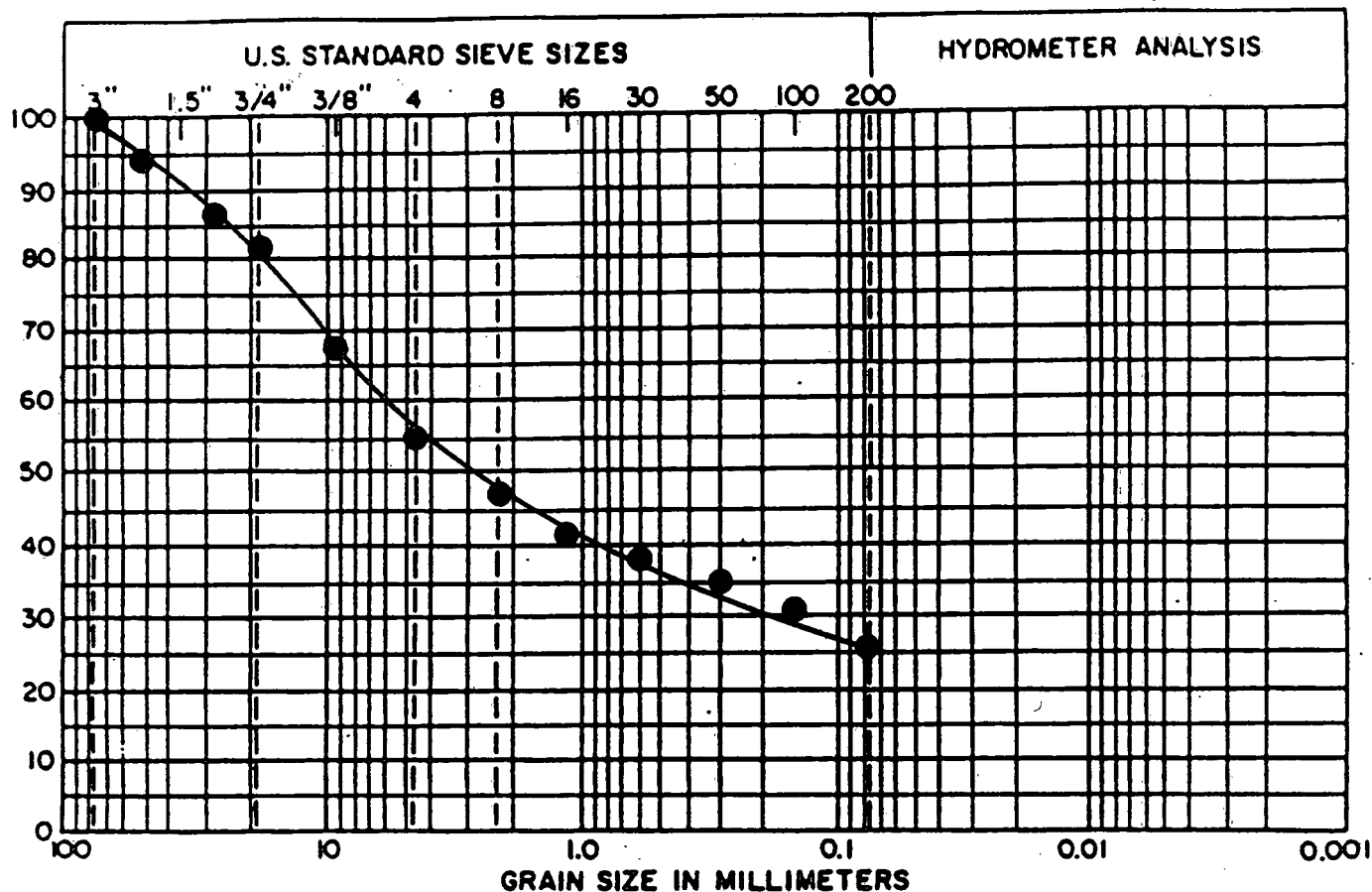
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

 LIQUID LIMIT --- PLASTICITY INDEX ---

 DESCRIPTION Sand, gravelly, moist, dense, lt. tan USCS SW

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	81	30	.590	30	.019	
			3/8"	9.50	67	50	.297	27	.009	
3"	0"	100	4	4.750	53	100	.149	22	.005	
2"	.0"	94	8	2.380	44	200	.074	14	.002	
1"	1."	86	16	1.190	35	—	.037		.001	

GRAIN SIZE ANALYSIS



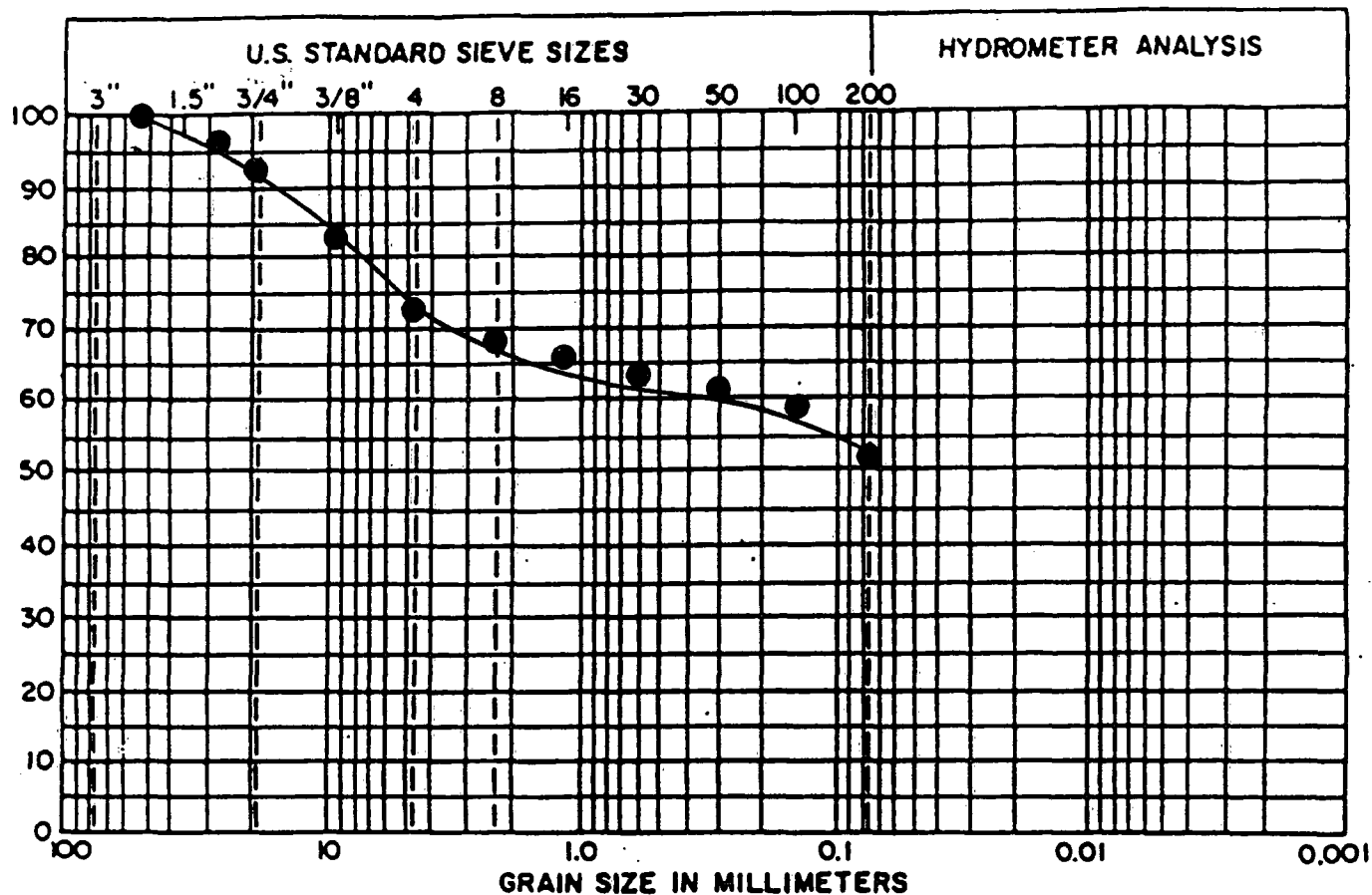
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

 LIQUID LIMIT PLASTICITY INDEX

 DESCRIPTION Silty Sand, gravelly, dense, moist, lt. tan JCS SW

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	81	30	.590	38	.019	
			3/8"	9.50	67	50	.297	35	.009	
3"	.0"	100	4	4.750	55	100	.149	32	.005	
2"	.0"	94	8	2.380	47	200	.074	26	.002	
1"	1. "	86	16	1.190	41	—	.037		.001	

GRAIN SIZE ANALYSIS



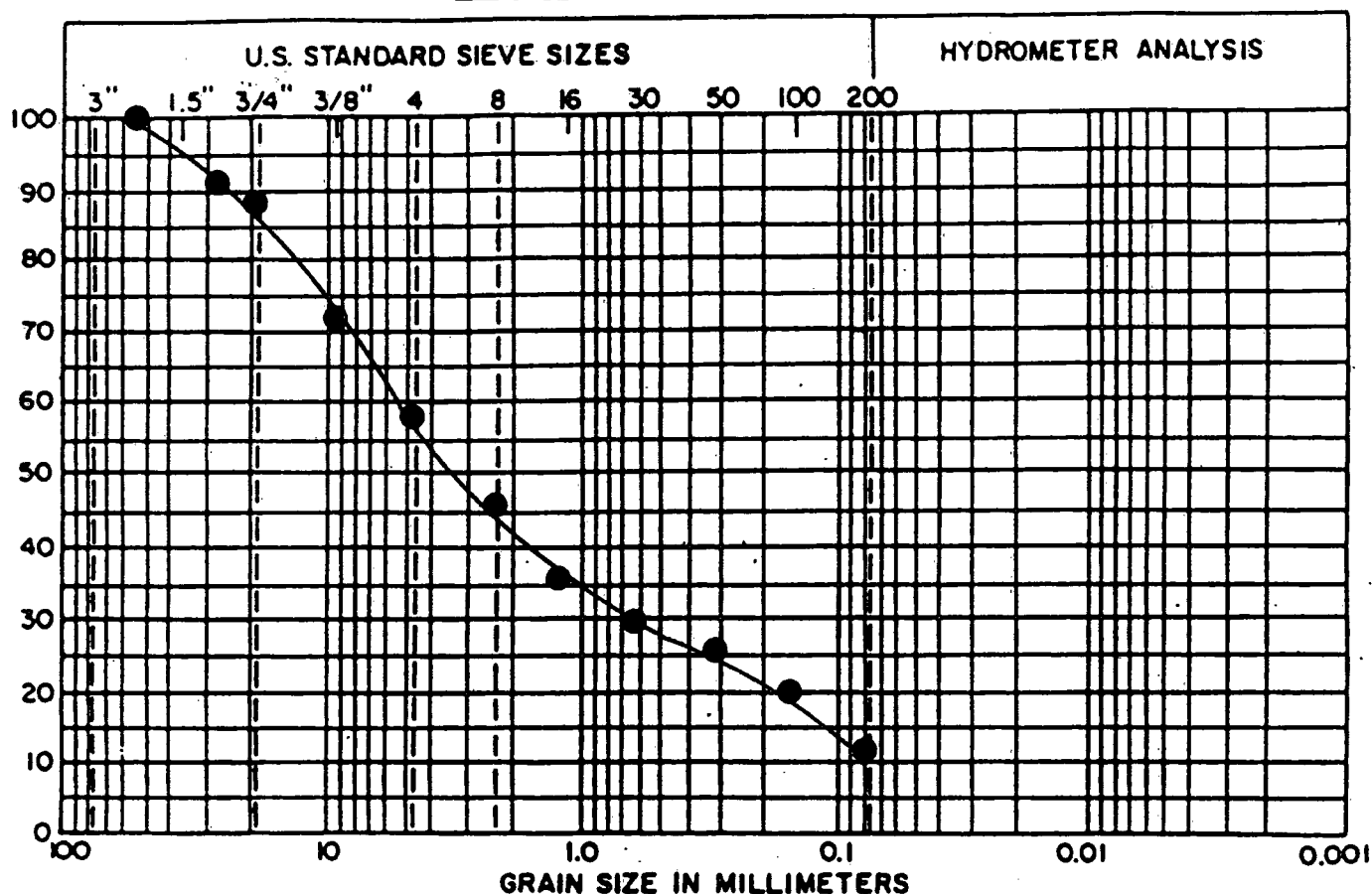
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

 LIQUID LIMIT --- PLASTICITY INDEX ---

 DESCRIPTION Silt, sl. gravelly, dense, moist, lt. tan USCS ML

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
3"	.0"		3/4"	19.00	93	30	.590	64	.019	
2"	.0"	100	3/8"	9.50	83	50	.297	62	.009	
1"	1."	97	4	4.750	73	100	.149	59	.005	
			8	2.380	69	200	.074	52	.002	
			16	1.190	67	—	.037		.001	

GRAIN SIZE ANALYSIS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

 LIQUID LIMIT -- PLASTICITY INDEX --

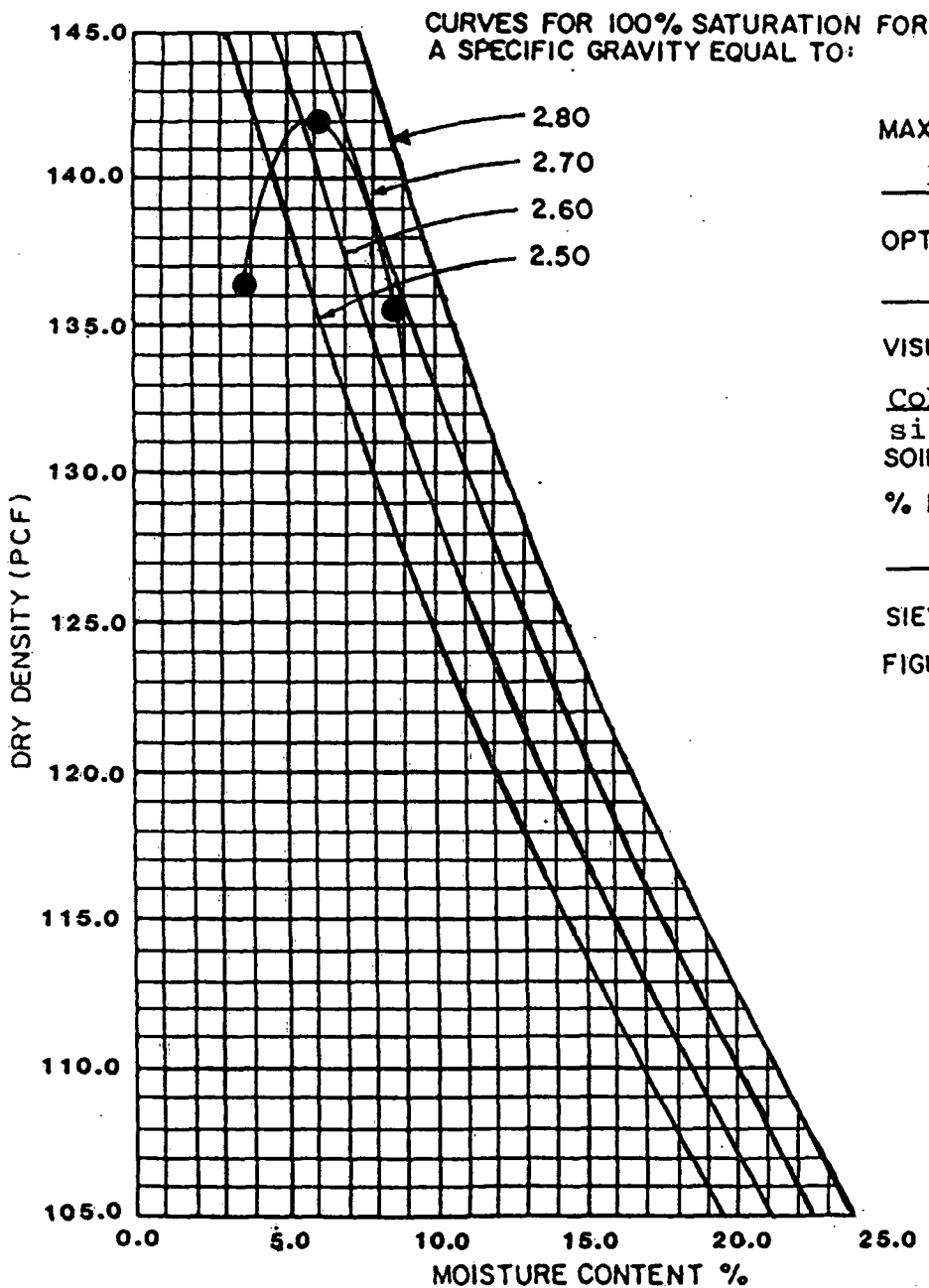
 DESCRIPTION Sand, gravelly, dense, moist, lt. tan USCS SW

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	88	30	.590	30	.019	
			3/8"	9.50	72	50	.297	26	.009	
3"	.0"		4	4.750	58	100	.149	21	.005	
2"	.0"	100	8	2.380	46	200	.074	13	.002	
1"	1. "	92	16	1.190	37	—	.037		.001	

LAB SRK Field LAB NO. _____
 CLIENT Hecla Mining Co. PROJECT Apex Unit
 FEATURE Subgrade at PROJECT NO. 22201
Pond 3-A
 SAMPLE NO. 5 DATE TESTED 9-20-89
 Proctor No. 1

MOISTURE-DENSITY RELATIONSHIPS
PROCTOR COMPACTION TEST

ASTM DESIGNATION: D698 METHOD: D



MAXIMUM DRY DENSITY

141.8 PCF

OPTIMUM MOISTURE CONTENT

5.8 %

VISUAL DESCRIPTION

Cobbly gravel, sandy, sl.
silty, lt.gray, dense, dry
 SOIL PROPERTIES:

% PASSING No. 200 U.S. SIEVE

9%

SIEVE ANALYSIS REFERENCE

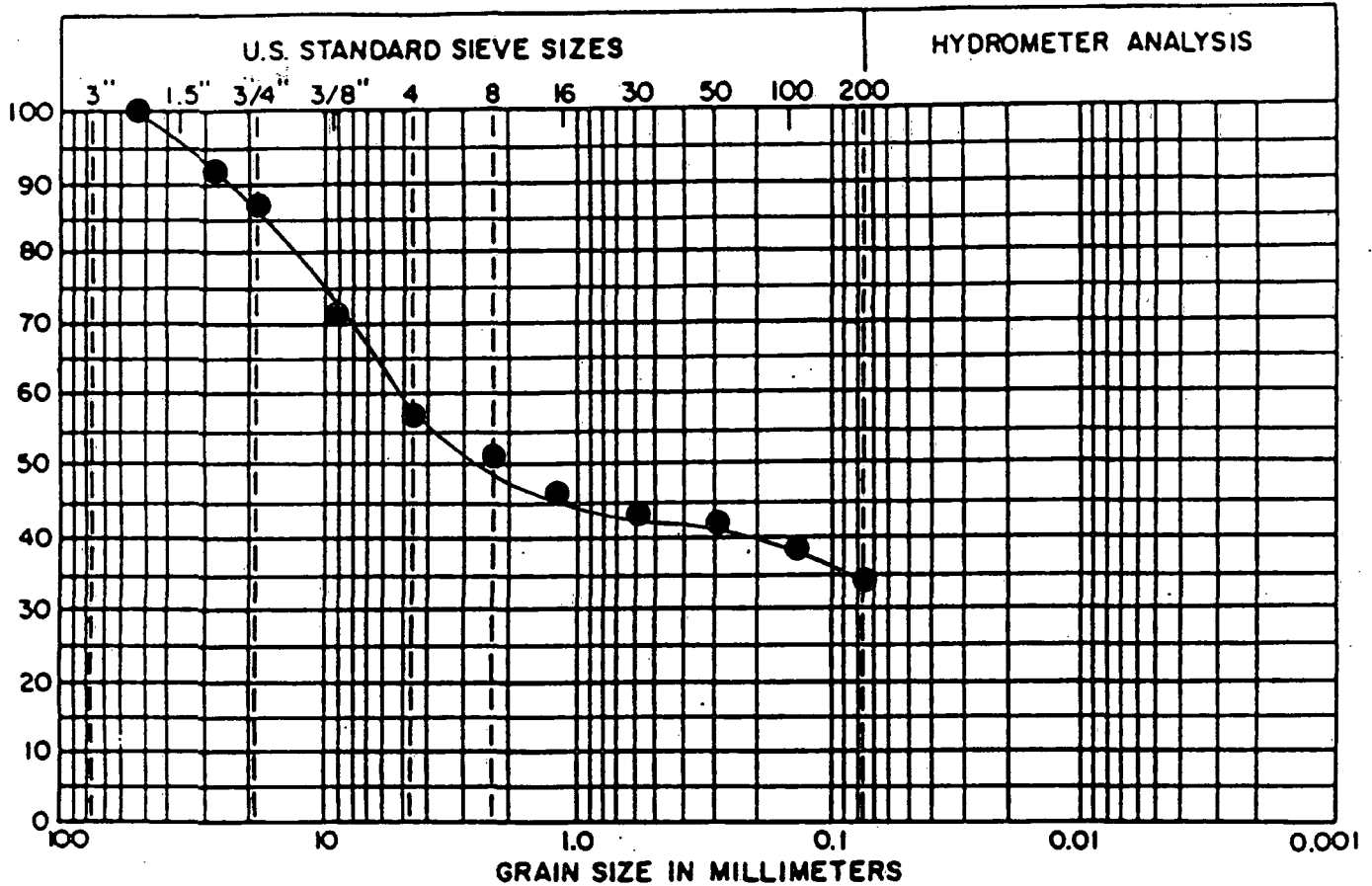
FIGURE No. 5

LL 10.1

PL 0

PI N.P.

GRAIN SIZE ANALYSIS



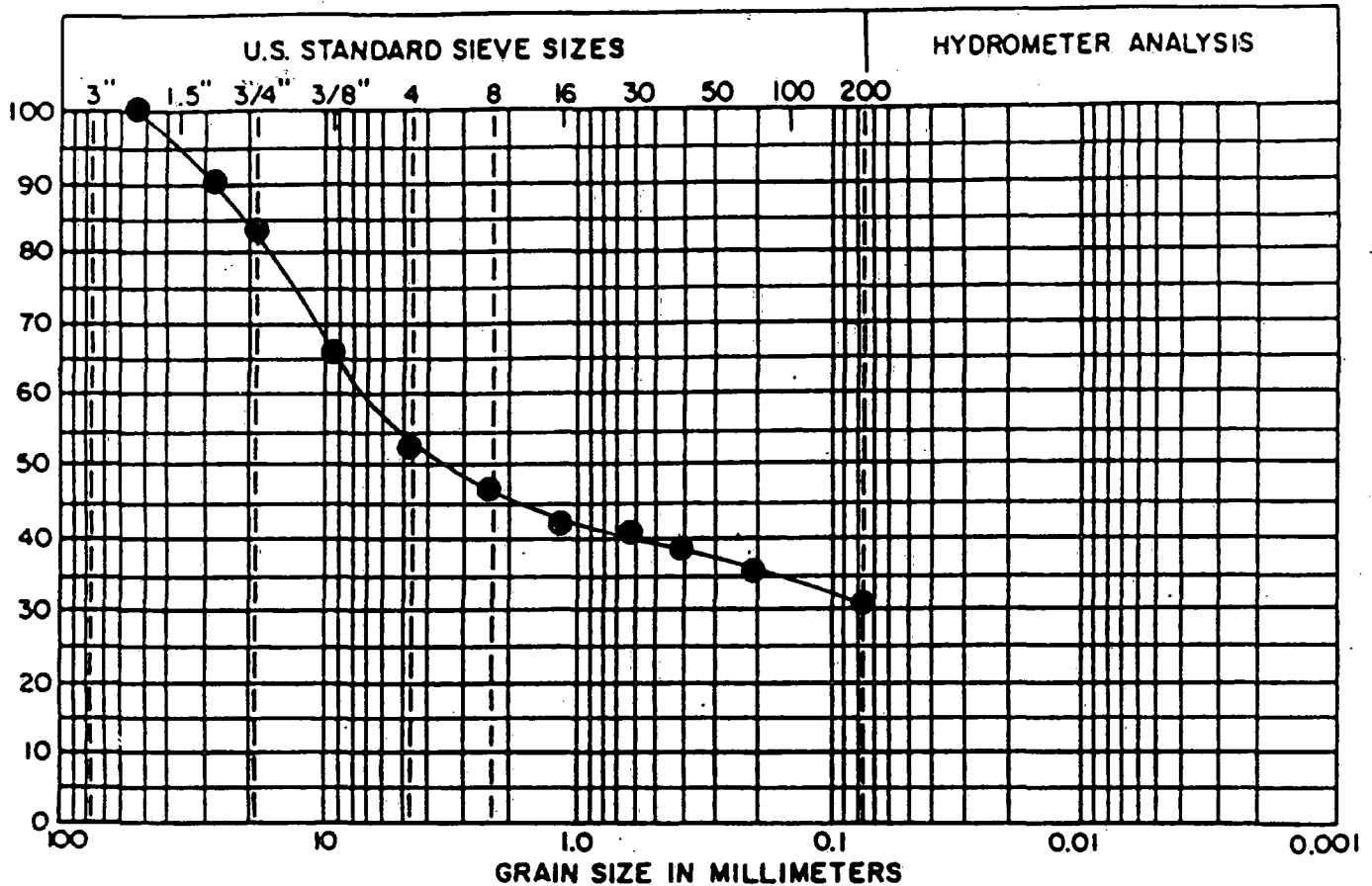
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

 LIQUID LIMIT --- PLASTICITY INDEX N.P.

 DESCRIPTION Silt, sandy, gravelly, dense, moist, lt. USCS ML tan

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	86	30	.590	43	.019	
			3/8"	9.50	71	50	.297	41	.009	
3"	.0"		4	4.750	57	100	.149	38	.005	
2"	.0"	100	8	2.380	51	200	.074	34	.002	
1"	1. "	92	16	1.190	46	—	.037		.001	

GRAIN SIZE ANALYSIS



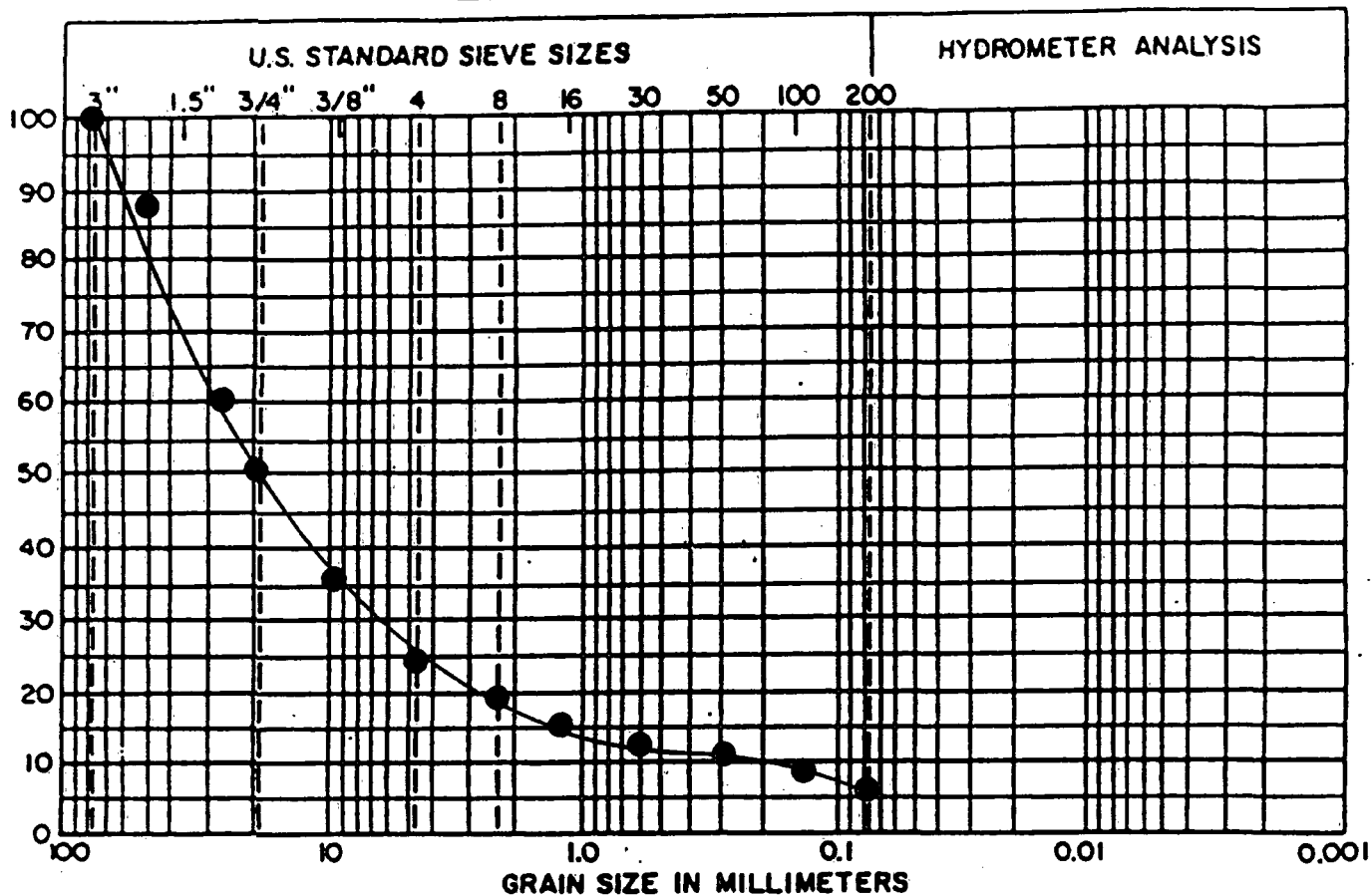
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

LIQUID LIMIT --- PLASTICITY INDEX N.P.

DESCRIPTION Silt, sandy, gravelly, dense, moist, tan USCS ML

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	84	30	.590	41	.019	
			3/8"	9.50	66	50	.297	39	.009	
3"	.0"		4	4.750	53	100	.149	36	.005	
2"	.0"	100	8	2.380	47	200	.074	32	.002	
1"	1."	90	16	1.190	43	—	.037		.001	

GRAIN SIZE ANALYSIS



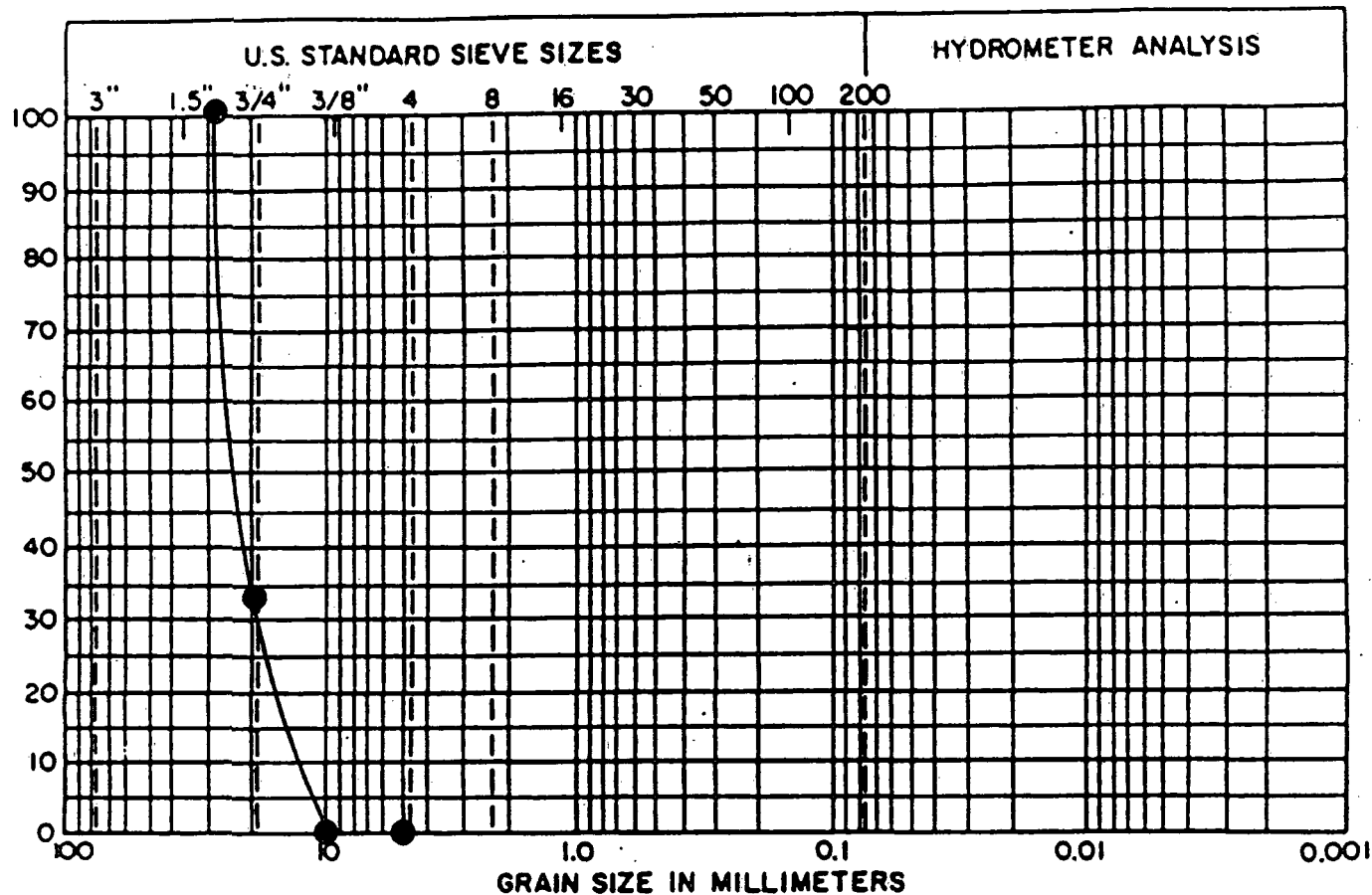
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

LIQUID LIMIT --- PLASTICITY INDEX --- N.P.

DESCRIPTION Gravel, sl. sandy, dense, dry, lt. gray USCS GM

U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	U.S. Sieve	Particle Size mm	Percent Finer	Particle Size mm	Percent Finer
			3/4"	19.00	50	30	.590	14	.019	
			3/8"	9.50	37	50	.297	12	.009	
3"	.0"	100	4"	4.750	25	100	.149	9	.005	
2"	.0"	88	8"	2.380	20	200	.074	6	.002	
1"	1."	60	16"	1.190	16	---	.037		.001	

GRAIN SIZE ANALYSIS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

LIQUID LIMIT -- PLASTICITY INDEX --

DESCRIPTION Gravel, gray, sub-rounded, angular & round USCS GM
-1" concrete rock, screened

U.S. Sieve	Particle Size mm	Percent Finer
5.0"	126.7	
3.0"	76.0	
1. "		100

U.S. Sieve	Particle Size mm	Percent Finer
3/4"	19.00	34
3/8"	9.50	1
4	4.750	0
8	2.380	
16	1.190	

U.S. Sieve	Particle Size mm	Percent Finer
30	.590	
50	.297	
100	.149	
200	.074	
—	.037	

Particle Size mm	Percent Finer
.019	
.009	
.005	
.002	
.001	

APPENDIX B
SITE ACCEPTANCE FORMS
POND 3-A AND 1A/1B

SITE INSPECTION AND EARTHWORK ACCEPTANCE

~~ECHO BAY, MCCOY COVE PROJECT~~

Apex Project

~~PHASE 4~~

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
Troy Keller	Cust Liners	Supervisor
Garry Whittaker	-	Technician in Training
Jeff Lockworth	-	-
Russell Mendenhall	-	-

SITE CONDITIONS:

TEMPERATURE Low 70°F to High 80°F WIND mild to gusty in P.M.

WEATHER Clear & mild

AREA PREPARED 40 mil HDPE Liner DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS: no preparation was made to sub-grade except those previously noted in daily reports. Liner was not removed for inspection by Cust Liners.

REMEDIAL ACTIONS: None

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by ~~Cagle West, Inc.~~ Cust Liners, except as noted under remedial actions (unless approved).

COMMENTS:

Troy Keller
(SIGNED)

[Signature]
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PROJECT - Apex Ponds

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Trig Keller</u>	<u>Crest-Liners</u>	<u>Supervisor</u>
<u>Garry Whitaker</u>	<u>-</u>	<u>Tech. in Training</u>
<u>Jeff Wadsworth</u>	<u>-</u>	<u>-</u>
<u>Russell Mendenhall</u>	<u>-</u>	<u>-</u>

SITE CONDITIONS:

TEMPERATURE mid 70°f to Low 90°f. WIND A.M. Calm, P.M. gusty

WEATHER Clear & mild

AREA PREPARED 40 mil HDPE in place DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS: no preparation was made to subgrade except those previously noted in daily reports. Liner was not removed for construction inspection.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Trig Keller
(SIGNED)

James Gagle
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PROJECT: Hecla Mining Co.
Apex Project

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Troy Keller</u>	<u>Crest Liner</u>	<u>Supervisor</u>
<u>Garry Whittaker</u>	<u>-</u>	<u>Tech. in training</u>
<u>Jeff Wicksworth</u>	<u>-</u>	<u>-</u>
<u>Russell Mendenhall</u>	<u>-</u>	<u>-</u>

SITE CONDITIONS:

TEMPERATURE: mid. 50° to Mid. 90°f WIND AN. Light P.M. strong gusty

WEATHER High Thin clouds - Mild

AREA PREPARED none (40 mil HDPE) in place DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS no preparation of sub-grade was made except those previously noted on Daily reports for earth work. Liner was not removed for
Cart liners Inspection.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Troy Keller
(SIGNED)

[Signature]
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
Troy Keller	Crest Lines	Supervisor
Garry Whittaker	-	Technician in Training
Jeff Wadsworth	-	-
Russell Mendenhall	-	-

SITE CONDITIONS:

TEMPERATURE mid 50s to Low 90°f. WIND A.M. mild P.M. gusty

WEATHER High cloud cover - mild

AREA PREPARED none (40 mil HDPE in place) DRAWING REFERENCE

DESCRIPTION OF CONDITIONS: no preparation of sub-grade was made except as noted previously on Daily reports. Liner was not removed for Crest Lines inspection of sub-grade.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS:

Troy Keller

(SIGNED)

Garry Whittaker

(SIGNED)



STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

Hecla Mining Co. Apex Site

DATE 10-16-89

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Troy Keller</u>	<u>Crest Liners</u>	<u>Supervisor</u>
<u>Garvy Whitaker</u>	<u>-</u>	<u>Tech. in Training</u>
<u>Jett Wadsworth</u>	<u>-</u>	<u>-</u>
<u>Russell Mendelhall</u>	<u>-</u>	<u>-</u>

SITE CONDITIONS:

TEMPERATURE mid 40's. to high 70's WIND Art. mild p.m. gusty

WEATHER High Clouds & mild

AREA PREPARED none (40 mil HDPE in place) DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS: no preparation of sub-grade was made except as noted previously on daily reports. Liner was not removed for Crest Liners inspection of sub-grade.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Troy Keller
(SIGNED)

Gagle West, Inc.
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Heck Mining Co. Apr. Unit Pond 3-A 60 mil HDPE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Troy Keller</u>	<u>Crest Liners</u>	<u>Supervisor</u>
<u>Gary Whittaker</u>	<u>"</u>	<u>Tech. in Training</u>
<u>Jeff Wadsworth</u>	<u>"</u>	<u>"</u>
<u>Russell Menzies</u>	<u>"</u>	<u>"</u>

SITE CONDITIONS:

TEMPERATURE 47°F at 7:30/88°F at 1630 WIND calm to gusty in P.M.

WEATHER Clear & Mild
60 mil being placed over 40 mil

AREA PREPARED in place DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS: 40 mil liner broken & clean

REMEDIAL ACTIONS:

_____	APPROVED
_____	APPROVED
_____	APPROVED
_____	APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Troy Keller
(SIGNED)

[Signature]
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Hecla Mining Co. Apex Unit Panel 3-A 60 mil HDPE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
------	--------------	----------

Troy Keller

Crest Liners

Supervisor

Jeff Wadsworth

Tech. in Training

Russell Mendonhall

SITE CONDITIONS:

TEMPERATURE 56°F at 0730 to WIND calm to

WEATHER overcast

AREA PREPARED 60 mil HDPE being placed over 40 mil in place DRAWING REFERENCE

DESCRIPTION OF CONDITIONS 40 mil HDPE was broomed clean prior to being covered by 60 mil HDPE.

REMEDIAL ACTIONS:

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS:

Troy Keller

(SIGNED)

Gagle West

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Hecla Mining Co. Apex Unit Pond 3-A Bottom Liner

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Tom Jernigan</u>	<u>Cost. Linc.</u>	<u>Site Supt.</u>
<u>Donna Carica</u>	<u>-</u>	<u>Tech.</u>
<u>David Gilly</u>	<u>-</u>	<u>Tech.</u>
<u>Way Koller</u>	<u>-</u>	<u>Foreman</u>
<u>Jeff Wadsworth</u>	<u>-</u>	<u>Tech.</u>
<u>Quince Mendickall</u>	<u>-</u>	<u>Tech.</u>

SITE CONDITIONS:

TEMPERATURE 56° F to 78° WIND Calm to Breezy

WEATHER Overcast, Threatening Rain

AREA PREPARED _____ DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Rain over the weekend washed ruts on slopes below
this 40 mil liner. The sub-grade on Pond 3-A was too wet to drive on.

REMEDIAL ACTIONS: no action to be taken until subgrade dries

JPA
APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Tom Jernigan

(SIGNED)

Glen Gage

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Hecla Mining Co. Appendix Pond 3-A Bottom Liner

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Tom Jernigan</u>	<u>Crest Liners</u>	<u>Site Supt.</u>
<u>Donnie Carlson</u>		<u>Tech.</u>
<u>David Gilly</u>		<u>Tech.</u>
<u>Trey Koller</u>		<u>Foreman</u>
<u>Jeff Whitworth</u>		<u>Tech.</u>
<u>Russell Handman</u>		<u>Tech.</u>

SITE CONDITIONS:

TEMPERATURE 47°F to 76°F WIND Breezy to Windy by mid A.M.

WEATHER Clearing in A.M.

AREA PREPARED Approx. 20' DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Repaired washed areas below gravel liner in place prior to deployment
Excavated approximately 300 ft of anchor trench East & West sides of Pond 3-A. Gravelly & rolling of
bottom to be done prior to deployment at sometime in future. The anchor trench excavation
is proceeding very slowly as is the build up of the east berm at extension
of Pond 3-A for road access to the pond.

REMEDIAL ACTIONS: Repaired side slope washouts just prior to deployment

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Cagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Tom Jernigan

(SIGNED)

John J. Jernigan

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 23201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Janigan</u>	<u>Crest-Liners</u>	<u>Site Supt.</u>
<u>Donnie Carlson</u>		<u>Tech</u>
<u>David Gilly</u>		<u>"</u>
<u>Ivy Keller</u>		<u>Foreman</u>
<u>Jeff Wadsworth</u>		<u>Tech.</u>

SITE CONDITIONS:

TEMPERATURE 56°f to 65°f WIND 50 plus gusts in P.M.

WEATHER Overcast with heavy rainstorms in P.M.

AREA PREPARED Anchor trench & 20' Beneath 40 mil liner in place DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Repaired washed areas below 40 mil liner at slopes prior to deployment. Excavated approx. 200 linear ft. of anchor trench on west slope berm. Construction of access road continues at exterior slope of East Berm.

REMEDIAL ACTIONS: Repaired side slopes at wash outs & broomed

APPROVED

40 mil Liner prior to 60 mil deployment

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor:

Jim Jany

(SIGNED)

SRK Representative:

Jim Jany

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 29201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jannigan</u>	<u>Crest-Liner</u>	<u>Site Supt.</u>
<u>Froy Kellard</u>		<u>Foreman</u>
<u>Donnie Carlson</u>		<u>Technician</u>
<u>David Gilly</u>		
<u>Jeff Wadsworth</u>		

SITE CONDITIONS:

TEMPERATURE 38°F to 75°F WIND Calm

WEATHER Clear mild

AREA PREPARED _____ DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Rain yesterday prevents any deployment today.
Crews went to TEM for pulling 40 mil liner into place which had blown out
in yesterday's winds. Slopes need to be re-graded.

REMEDIAL ACTIONS: Pumping out sump. Allow grade & liner to dry.

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor:

Tom Jannigan

(SIGNED)

SRK Representative:

John Jannigan

(SIGNED)

DATE 10-27-89

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 22301

PERSONNEL PRESENT:

Area: Pond 3-A

NAME

REPRESENTING

POSITION

Tom Jamigan

Crest Liner

Site Supt.

Thoy Keller

-

Foreman

Donnie Carlson

-

Technician

David Gilly

-

Jeff Wadsworth

-

SITE CONDITIONS:

TEMPERATURE 53°f to 76°f. WIND slight

WEATHER Clear & mild

AREA PREPARED Reshaped slope beneath 40 mi² ^{lin} DRAWING REFERENCE -

DESCRIPTION OF CONDITIONS Sub-grade drying - Lining at east slope -

REMEDIAL ACTIONS:

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor: Tom Jamigan

SRE Representative: [Signature]

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 29301

PERSONNEL PRESENT:

Area: Fond 3-A

NAME

REPRESENTING

POSITION

Tom Jernigan

Crest Liner

Site Supt.

Thy Keller

Donnie Carlson

David Grilly

Jeff Wadsworth

Foreman

Technician

SITE CONDITIONS:

TEMPERATURE 42° to

WIND Calisto

WEATHER Clear

AREA PREPARED Reshaped slope at East Bank
Beneath 40 mil liner

DRAWING REFERENCE

DESCRIPTION OF CONDITIONS Subgrade drying - Liner dry at east slope

Rogers Corp. started repairs to sub-grade surface at 0830 hrs.

REMEDIAL ACTIONS:

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor:

[Signature]

(SIGNED)

SRE Representative:

[Signature]

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apeir Project

Project No.: 29201

PERSONNEL PRESENT:

NAME	REPRESENTING	Area: <u>Pond 3-A</u> POSITION
<u>Tom Jennigan</u>	<u>Crest-Liners</u>	<u>Site Supt.</u>
<u>Ray Keller</u>		<u>Foreman</u>
<u>Damie Carlson</u>		<u>Technicians</u>
<u>David Gilly</u>		<u>Technician</u>
<u>Jeff Wadsworth</u>		
<u>Robin May</u>		<u>laborer</u>
<u>Ben Lane</u>		
<u>Randy Withers</u>		

SITE CONDITIONS:

TEMPERATURE 44° to 62° WIND lt. in A.M. & p.m.

WEATHER Clear & Cool

AREA PREPARED West Slope Below 40 mi HDE DRAWING REFERENCE -

DESCRIPTION OF CONDITIONS All areas of Pond 3-A & dry with the exception of the Sump.

REMEDIAL ACTIONS: none required

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor:

Tom Jennigan

(SIGNED)

SRE Representative:

Glen Jones

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

~~ECHO BAY, MCCOY COVE PROJECT~~

~~Apex Project~~

~~PHASE II~~

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
Troy Keller	Cust Liners	Supervisor
Garry Whittaker	"	Technician in Training
Jeff Workworth	"	"
Russell Mendenhall	"	"

SITE CONDITIONS:

TEMPERATURE Low 70°F to High 80°F WIND Mild to gusty in P.M.

WEATHER Clear & Mild

AREA PREPARED 40 mil HDPE Liner DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS: no preparation was made to sub-grade except those previously noted in daily reports. Liner was not removed for inspection by Cust Liners.

REMEDIAL ACTIONS: None

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by ~~Eagle West, Inc.~~ Cust Liners, except as noted under remedial actions (unless approved).

COMMENTS: _____

Troy Keller

(SIGNED)

[Signature]

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PROJECT - Apex Roads

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
------	--------------	----------

Tracy Keller

Crest Liners

Supervisor

Garry Whitaker

-

Tech. in Training

Jeff Wadsworth

-

-

Russell Mendenhall

-

-

SITE CONDITIONS:

TEMPERATURE mid 70°F to Low 90°F.

WIND A.M. Calm, P.M. gusty

WEATHER Clear & mild

AREA PREPARED 40 mil HDPE in place

DRAWING REFERENCE

DESCRIPTION OF CONDITIONS: no preparation was made to subgrade except those previously noted in daily reports. Liner was not installed for continuous inspection.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS:

Tracy Keller

(SIGNED)

John Gage

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PROJECT: Heck Mining Co.
Apex Project

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Troy Keller</u>	<u>Crest Lines</u>	<u>Supervisor</u>
<u>Garry Whittaker</u>	<u>"</u>	<u>Tech. in training</u>
<u>Jeff Wicksworth</u>	<u>"</u>	<u>"</u>
<u>Russell Mendenhall</u>	<u>"</u>	<u>"</u>

SITE CONDITIONS:

TEMPERATURE: Mid. 50° to Mid. 90° F WIND AM. Light P.M. strong gusty

WEATHER High Thin clouds - Mild

AREA PREPARED none (40 mil HDPE in place) DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS no preparation of sub-grade was made except those previously noted on Daily reports for earth work. Liner was not removed for Crest Lines Inspection.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Troy Keller
(SIGNED)

[Signature]
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
Troy Keller	Crest Lines	Supervisor
Garry Whittaker	-	Technician in Training
Jeff Wedsworth	-	-
Russell Mendenhall	-	-

SITE CONDITIONS:

TEMPERATURE Mid 80° to Low 90° F. WIND A.M. mild P.M. gusty

WEATHER High cloud cover, mild

AREA PREPARED none (40 mil HDPE in place) DRAWING REFERENCE

DESCRIPTION OF CONDITIONS: no preparation of sub-grade was made except as noted previously on Daily reports. Liner was not removed for Crest Lines inspection of sub-grade.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS:

Troy Keller

(SIGNED)

Garry Whittaker

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
Troy Keller	Crust Liners	Supervisor
Garry Whitaker	-	Tech. in Training
Jeff Wadsworth	-	-
Russell Menckshill	-	-

SITE CONDITIONS:

TEMPERATURE mid 40°f. to high 70°f. WIND S.W. mild P.M. Cloudy

WEATHER High Clouds & mild

AREA PREPARED none (40 mil HDPE in place) DRAWING REFERENCE

DESCRIPTION OF CONDITIONS: no preparation of sub-grade was made except as noted previously on daily reports. Liner was not removed for Crust Liners inspection of sub-grade.

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS:

Troy Keller

(SIGNED)

Garry Whitaker

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Heck Mining Co Apex Unit Pond 3-A 60 mil HDPE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Troy Keller</u>	<u>Crest Liners</u>	<u>Supervisor</u>
<u>Gary Whitaker</u>	<u>"</u>	<u>Tech in Technology</u>
<u>Jeff Wadsworth</u>	<u>"</u>	<u>"</u>
<u>Russell Hendrick</u>	<u>"</u>	<u>"</u>

SITE CONDITIONS:

TEMPERATURE 47°F at 7:30/88°F at 1630 WIND calm to gusty in P.M.

WEATHER Clear & Mild
60 mil being placed over 40 mil

AREA PREPARED in place DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS: 40 mil liner burned & clean

REMEDIAL ACTIONS: _____

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Troy Keller
(SIGNED)

[Signature]
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Hecla Mining Co. Apex Unit Panel 3-A 60 mil HDPE

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Troy Keller</u>	<u>Crest Liners</u>	<u>Supervisor</u>
<u>Jeff Wackemuth</u>		<u>Tech. in Training</u>
<u>Russell Mendenhall</u>		

SITE CONDITIONS:

TEMPERATURE 56°F at 0730 to WIND calm to

WEATHER overcast

AREA PREPARED 60 mil HDPE being placed over 40 mil in place DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS 40 mil HDPE was broomed clean prior to being covered by 60 mil HDPE.

REMEDIAL ACTIONS:

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS:

Troy Keller
(SIGNED)

Gagle West, Inc.
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Hecla Mining Co. Apex Unit Pond 3-A Bottom Liner

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
<u>Tom Jernigan</u>	<u>Cost Lines</u>	<u>Site Supt.</u>
<u>Dennis Carlson</u>	<u>-</u>	<u>Tech.</u>
<u>David Gilly</u>	<u>-</u>	<u>Tech.</u>
<u>Way Koller</u>	<u>-</u>	<u>Foreman</u>
<u>Jeff Underwood</u>	<u>-</u>	<u>Tech.</u>
<u>Quincy Hendrickson</u>	<u>-</u>	<u>Tech.</u>

SITE CONDITIONS:

TEMPERATURE 56° F to 78° WIND Calm to Breezy

WEATHER Overcast, Thinning Rain

AREA PREPARED _____ DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Rains over the weekend washed ruts on slopes below the 40 unit liner. The sub-grade on Pond 3-A was too wet to drive on.

REMEDIAL ACTIONS: no action to be taken until subgrade dries

JRK
APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS: _____

Tom Jernigan
(SIGNED)

Glen Jones
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Hecla Mining Co. Apex Unit Pond 3-A Bottom Liner

PERSONNEL PRESENT:

NAME	REPRESENTING	POSITION
Tom Jernigan	Crest Liners	Site Supt.
Dannie Carlson		Tech.
David Gilly		Tech.
Troy Keller		Foreman
Jeff Underworth		Tech.
Russell Mendenhall		Tech.

SITE CONDITIONS:

TEMPERATURE 47°F to 76°F WIND Breezy to Windy by mid A.M.

WEATHER Clearing in A.M.

AREA PREPARED Approx. 20' DRAWING REFERENCE

DESCRIPTION OF CONDITIONS Repaired washed areas below final liner in place prior to deployment. Excavated approximately 200 ft of anchor trench East & West sides of Pond 3-A. Grading & rolling of bottom to be done prior to deployment at sometime in future. The anchor trench excavation is proceeding very slowly as is the build up of the east berm at exterior of Pond 3-A for road access to the pond.

REMEDIAL ACTIONS: Repaired side slope washouts just prior to deployment

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Gagle West, Inc., except as noted under remedial actions (unless approved).

COMMENTS:

Tom Jernigan

(SIGNED)

[Signature]

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apor Project

Project No.: 23201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jamison</u>	<u>Crest-Liners</u>	<u>Site Supt.</u>
<u>Donnie Carlson</u>		<u>Tech.</u>
<u>David Gilly</u>		<u>"</u>
<u>Ray Keller</u>		<u>Foreman</u>
<u>Jeff Wadsworth</u>		<u>Tech.</u>

SITE CONDITIONS:

TEMPERATURE 56°f to 65°f WIND 50 plus gusts in P.M.

WEATHER Overcast with heavy rainstorms in P.M.

AREA PREPARED Anchor trench & 20' Beneath 40 mil liner in place DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Repaired washed areas below 40 mil liner at slopes prior to deployment. Excavated approx. 200 Linear ft. of anchor trench on west slope berm. Construction of access road continues at exterior slope of East Berm.

REMEDIAL ACTIONS: Repaired side slopes at work cuts & broomed

APPROVED

40 mil Liner prior to 60 mil deployment

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor:

Tom Jamison

(SIGNED)

SRE Representative:

Jim Jamison

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 29301

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jannigan</u>	<u>Crest-Liner</u>	<u>Site Supt.</u>
<u>Troy Keller</u>		<u>Foreman</u>
<u>Downie Carlson</u>		<u>Technician</u>
<u>David Gilly</u>		
<u>Jeff Wadsworth</u>		

SITE CONDITIONS:

TEMPERATURE 38°F to 70°F WIND Calm

WEATHER Clear mild

AREA PREPARED _____ DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Rain yesterday prevents any deployment today.
Crews went to T&M for pulling 40 mil liner into place which had blown out
in yesterday's winds. Slopes need to be re-graded.

REMEDIAL ACTIONS: Pumping out sump. Allow grade & liner to dry.

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor:

Tom Jannigan

(SIGNED)

SRK Representative:

Jim Jannigan

(SIGNED)



STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

DATE 10-27-89

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hecla Mining Co. Apex Project

Project No.: 22201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jamigan</u>	<u>Crest Liner</u>	<u>Site Supt.</u>
<u>Troy Keller</u>	<u>-</u>	<u>Foreman</u>
<u>Danile Carlson</u>	<u>-</u>	<u>Technician</u>
<u>David Gilly</u>	<u>-</u>	<u>-</u>
<u>Jeff Wadsworth</u>	<u>-</u>	<u>-</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

SITE CONDITIONS:

TEMPERATURE 53°F to 76°F WIND slight

WEATHER Clear & mild

AREA PREPARED Backfilled slope beneath 40' incl DRAWING REFERENCE -

DESCRIPTION OF CONDITIONS Subgrade drying - Liner dry at east slope -

REMEDIAL ACTIONS:

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor: Tom Jamigan

SRK Representative: [Signature] (SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hecla Mining Co. Apex Project

Project No.: 29201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME

REPRESENTING

POSITION

Tom Jernigan

Crest Liner

Site Supt.

Thoy Keller

Foreman

Danise Carlson

Technician

David Gilly

"

Jeff Wadsworth

"

SITE CONDITIONS:

TEMPERATURE 45° to

WIND Calm to

WEATHER Clear

AREA PREPARED Reshaped slope at East Bend
Beneath 40 mil liner

DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Sub-grade drying - liner dry at east slope

Rego Corp. started repairs to sub-grade surface at 0830 hrs.

REMEDIAL ACTIONS:

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor:

Tom Jernigan

(SIGNED)

SRK Representative:

John Jones

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 22201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jennigan</u>	<u>Crest-Liners</u>	<u>Site Supt.</u>
<u>Tracy Keller</u>		<u>Foreman</u>
<u>Danille Carlson</u>		<u>Technician</u>
<u>Daniel Gilly</u>		<u>Technician</u>
<u>Jeff Wadsworth</u>		<u>Technician</u>
<u>Robin May</u>		<u>laborer</u>
<u>Ben Lane</u>		<u>"</u>
<u>Randy Withers</u>		<u>"</u>

SITE CONDITIONS:

TEMPERATURE 44° to 62° WIND lt. in A.M. & p.m.

WEATHER Clear & Cool

AREA PREPARED West Slope Below 40 mil HDPE DRAWING REFERENCE -

DESCRIPTION OF CONDITIONS All areas of Pond 3-A & dry with the exception of the Sump.

REMEDIAL ACTIONS: none required

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor:

Tom Jennigan

(SIGNED)

SRE Representative:

Glen Jones

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hock Mining Co. Apex Project

Project No.: 29201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
Tom Jamigan	Crest Liners	Site Supt.
Troy Keller	-	Foreman
Dorrie Carlson	-	Tech.
David Gilly	-	Tech.
Jeff Wadsworth	-	Labourers
Robin May	-	-
Ben Lane	-	-
Randy Withers	-	-
Landon Evans	-	-

SITE CONDITIONS:

TEMPERATURE 33° to 70°f WIND lt. in A.M. lt. in P.M.

WEATHER Clear & cool

AREA PREPARED Anchor Trench West Side DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS scrap at Pond 3-A is still drying from recent rains.

REMEDIAL ACTIONS: none required

APPROVED
APPROVED
APPROVED
APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor: Tom Jamigan
(SIGNED)

SRE Representative: John Jones
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apeir Project

Project No.: 22201

PERSONNEL PRESENT:

NAME	REPRESENTING	Area: <u>3-A</u> POSITION
Tom Jannigan		site Superintendent
Troy Keller	Crest liners	Foreman
Donnie Carlson	"	Tech.
David Gilly	"	Tech.
Jeff Hurdsworth	"	haborer
Robin May	"	"
Ben Lane	"	"
Randy Withers	"	"
Landon Evans	"	"

SITE CONDITIONS:

TEMPERATURE 39°F to 59°F WIND Very strong from the North

WEATHER Clear Blistery

AREA PREPARED one mil liner west slope DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Scum at Pond 3-A is still drying out.

REMEDIAL ACTIONS: None

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor:

Tom Jay

(SIGNED)

SRE Representative:

John G. G...

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Herk Mining Co. Apex Project

Project No.: 22201

PERSONNEL PRESENT:

Area: 3-A

NAME	REPRESENTING	POSITION
Tom Jernigan		
Thoy Keller	Crest-Liners	Site Supt.
Donnie Carlson		Frack.
David Gilly		Tech.
Jeff Heidmuntz		Laborer
Robin May		
Ben Lane		
Randy Withers		
Landen Evans		

SITE CONDITIONS:

TEMPERATURE 37°f to 64°f WIND lt. Breezy

WEATHER clean mild.

AREA PREPARED down 40 mt liner DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS good

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor: Tom Jernigan

(SIGNED)

SRK Representative: Glen Gung

(SIGNED)

DATE 11/3/89SITE INSPECTION AND EARTHWORK ACCEPTANCEProject: Hcla Mining Co. Apor ProjectProject No.: 23201PERSONNEL PRESENT:Area: 3A Pond

NAME	REPRESENTING	POSITION
Tom Jennings	crest liners	site supt
Thoy Keller		Foreman
Donnie Carlson		Tech
David Gilly		Tech.
Jeff Wadsworth		laborer
Robin May		
Ben Lane		
Randy Withers		
Landen, Evans		
Carlos Nelson		

SITE CONDITIONS:TEMPERATURE 33°f to 64°f WIND calm in A.M. Breezy in P.M.WEATHER Clear-Cool-mildAREA PREPARED liners 40mil in place DRAWING REFERENCE _____DESCRIPTION OF CONDITIONS goodREMEDIAL ACTIONS: None

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor: Tom Jennings

(SIGNED)

SRK Representative: C. J. Jones

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apor Project

Project No.: 22201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jernigan</u>	<u>Crest Liners</u>	<u>Site Supt.</u>
<u>Troy Keller</u>	<u>-</u>	<u>Frmm.</u>
<u>Donnie Carlson</u>	<u>-</u>	<u>Tech.</u>
<u>David Gilly</u>	<u>-</u>	<u>Tech.</u>
<u>E (6) Labours</u>		

SITE CONDITIONS:

TEMPERATURE 42° to 62°f WIND lt. N.E.M.

WEATHER Clear - Cool - with morning trend

AREA PREPARED entire bottom of Pond's sup DRAWING REFERENCE sub-grade

DESCRIPTION OF CONDITIONS good

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor:

Tom Jernigan

(SIGNED)

SRK Representative:

John J. Jones

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 22201

PERSONNEL PRESENT:

NAME	REPRESENTING	Area: <u>Panel 3-A</u> POSITION
<u>Tom Jernigan</u>	<u>Crest Liners</u>	<u>Site Supt.</u>
<u>Troy Keller</u>	<u>"</u>	<u>Foreman</u>
<u>Donnie Carlson</u>	<u>"</u>	<u>Tech</u>
<u>David Gilly</u>	<u>"</u>	<u>Tech</u>
<u>(8) laborers</u>		

SITE CONDITIONS:

TEMPERATURE 54°F to 72°F WIND Calm

WEATHER sl. overcast, mild Cool

AREA PREPARED Sub-grade DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS good

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor

Tom Jernigan

(SIGNED)

SRE Representative:

John J. Jernigan

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Herb Mining Co. Apor Project

Project No.: 22201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jernigan</u>	<u>Crest Liners</u>	<u>Site Supt.</u>
<u>Troy Keller</u>	<u>"</u>	<u>Foreman</u>
<u>Donnie Carlson</u>	<u>"</u>	<u>Technician</u>
<u>David Gilly</u>	<u>"</u>	<u>"</u>

SITE CONDITIONS:

TEMPERATURE 42°F to 88°F WIND 5 to 10 MPH in P.M.

WEATHER Partly Cloudy Mild

AREA PREPARED sub-grade DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS epod

REMEDIAL ACTIONS: none

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor: Tom Jernigan
(SIGNED)

SRC Representative: Glen Quinn
(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apor Project

Project No.: 23201

PERSONNEL PRESENT:

Area: Pond 3-A

NAME	REPRESENTING	POSITION
<u>Tom Jennigan</u>	<u>Crst Liners</u>	<u>Site Supt.</u>
<u>Tray Keller</u>	<u>"</u>	<u>Foreman</u>
<u>Donnie Carlson</u>	<u>"</u>	<u>Technician</u>
<u>David Gilly</u>	<u>"</u>	<u>"</u>

SITE CONDITIONS:

TEMPERATURE 42°f to 78° WIND lt. to gusty

WEATHER Clear & Mild

AREA PREPARED None DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS Bonding seams of panels placed yesterday.

REMEDIAL ACTIONS: None required

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crst-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: _____

Contractor: Tom Jennigan

(SIGNED)

SRK Representative: Glen Gump

(SIGNED)



STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

DATE 12/12/89

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 23201

PERSONNEL PRESENT:

Area: _____

NAME	REPRESENTING	POSITION
<u>DEBRA CARROLL</u>	<u>SRK</u>	<u>Q.A. INSPECTOR</u>
<u>GLEN GUYER</u>	<u>SRK</u>	<u>QA. INSPECTOR</u>
<u>LARRY MCGUIRE</u>	<u>CREST LINER</u>	<u>SUPERVISOR</u>

SITE CONDITIONS:

TEMPERATURE 46° AMB WIND LIGHT BREEZE

WEATHER CLEAR

AREA PREPARED 1 THROUGH 16 DRAWING REFERENCE FROM THE SOUTH

DESCRIPTION OF CONDITIONS EAST CORNER TO MID EAST SLOPE. SURFACE
WAS ACCEPTABLY SMOOTH AND TIGHT, WITH THE EXCEPTION OF SOME
"4" ROCKS AND ROOTS.

REMEDIAL ACTIONS: HAND PICKING OF ROOTS AND ROCKS BY

APPROVED

CREST LINER AND THE OWNER

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: NO HAND WORK WAS NEEDED ON PANELS 1 THROUGH 5 AND
ONE WAS DONE - yes it was - LMC - most of cell will
require this action

Contractor

LMC

(SIGNED)

SRK Representative

Debra Marshall

(SIGNED)

DATE 12/14/89

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 22201

PERSONNEL PRESENT:

Area: POND 1-AB

NAME

REPRESENTING

POSITION

DEBRA M CARROLL

SRK

QA INSPECTOR

SITE CONDITIONS:

TEMPERATURE 70°

WIND

WEATHER CLEAR

AREA PREPARED 32839' 59"

DRAWING REFERENCE

DESCRIPTION OF CONDITIONS 13452' AT THE NORTH EAST END OF THE EAST SLOPE
AND 13937' AT THE SOUTH WEST END OF THE WEST SLOPE. AREAS WERE
SMOOTH AND FREE OF ROCKS AND ROOTS

REMEDIAL ACTIONS: LABORER AND CREST LINER PICKED ROCKS

APPROVED

GEOTEXTILE WAS PLACED AT THE CREST OF SLOPES.

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: NO ONE ACCOMPANIED ME WHILE INSPECTING THE SUBGRADE SURFACE-SRK

Crest Liner picking stones in areas before deployment

Contractor

12/15/89

(SIGNED)

SRK Representative

(SIGNED)

DATE 12/15/89

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hecla Mining Co. Apor Project

Project No.: 23201

PERSONNEL PRESENT:

Area: POND 1AB

NAME

REPRESENTING

POSITION

DEBRA M CARROLL

SRK

Q.A. INSPECTOR

SITE CONDITIONS:

TEMPERATURE _____ WIND _____

WEATHER MILD, LIGHT BREEZE, PATCHIE CLOUDS

AREA PREPARED 23805.5 SQ. DRAWING REFERENCE _____

DESCRIPTION OF CONDITIONS 18357 SQUARE FEET OF THE WEST SLOPE WAS
SMOOTH AND TIGHT AND FREE OF ROCKS AND ROOTS, AS WAS 7074 SQUARE FEET
OF THE SOUTH SLOPE, 1580.5 SQUARE FEET OF THE SOUTH EAST CORNER, AND
1794 SQUARE FEET OF THE SOUTH WEST CORNER.

REMEDIAL ACTIONS: ROOTS AND ROCKS WERE PICKED BY CREST LINER

APPROVED

AND LABORER FOR THE OWNER, HOLES WERE FILLED BY THE LABORER.

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Crest-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS: A - OK

Contractor

LMC

12/16/89

(SIGNED)

SRK Representative

[Signature]

(SIGNED)

SITE INSPECTION AND EARTHWORK ACCEPTANCE

Project: Hack Mining Co. Apex Project

Project No.: 23201

PERSONNEL PRESENT:

Area: FOUL LINE

NAME

REPRESENTING

POSITION

LEDA M. CARROLL

SRK

J.A. INSPECTOR

SITE CONDITIONS:

TEMPERATURE

WIND

WEATHER CLDY, MIL, LIGHT FREEZE

AREA PREPARED 12617 SQUARE FEET

DRAWING REFERENCE

DESCRIPTION OF CONDITIONS SURFACE WAS SMOOTH AND TIGHT FOR 5741 SQUARE FEET OF
NORTH SLOPE, 1621 SQUARE FEET OF NORTH EAST CORNER SLOPE, 3507 SQUARE FEET OF
WEST SLOPE, AND 1506 SQUARE FEET OF SOUTH EAST CORNER.

REMEDIAL ACTIONS:

APPROVED

APPROVED

APPROVED

APPROVED

An inspection of the subgrade was made, for liner installation on the above referenced date, by the personnel referenced. The subgrade surface was found to be satisfactory and accepted by Great-Liner Inc. except as noted under remedial actions (unless approved).

COMMENTS:

Contractor

(SIGNED)

SRK Representative

(SIGNED)

APPENDIX C
GEOMEMBRANE
QUALITY CONTROL CERTIFICATION
FOR
POND 3A AND POND 1-A/1-B

NSc

National Seal Company

Corporate Office
1255 Monmouth Blvd.
P.O. Box 1448
Galesburg, IL 61402-1448
800/323-3820
309/343-3418
FAX 309/343-1536

June 21, 1989

Mr. Michael Snow
Crest-Liners, Inc.
2668 South 300 West
Salt Lake City, UT 84115

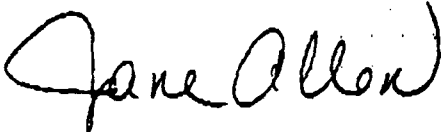
Dear Mr. Snow,

Please find enclosed the certifications for the 60 mil HDPE shipped June 20, 1989, for Crest-Liners, Inc. (799-55).

If you have any questions, please feel free to call.

Very truly yours,

NATIONAL SEAL COMPANY



Jane Allen
Quality Control Manager

JA/ja

NSC**GEOMEMBRANE CERTIFICATION**

Customer: Crest-Liners

Ship Date: June 20, 1989

Project:

Number of Rolls Shipped: 9

Order Number: 799-55

Nominal Thickness: 60 mil

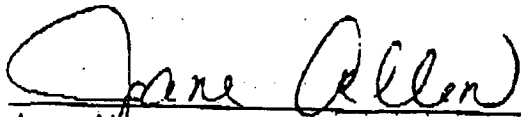
We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	57 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2


Jane Allen
Quality Control Manager

6-21-89
Date

NSC

June 21, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners

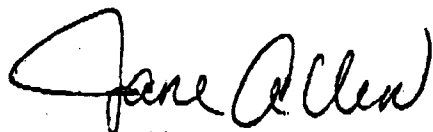
Resin Type: DHDA 5500

Project:

Order Number: 799-55

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. Moisture content was determined using an air circulating oven set at 100°C. The average test results are reported below.

Resin Blend Number	5040	5043	5044
Melt Flow Index (g/10 min)	0.48	0.47	0.47
Density (g/cm ³)	0.943	0.944	0.944
Carbon Black Content (percent)	2.41	2.36	2.40
Moisture Content (percent)	0.04	0.03	0.04

Jane Allen
Quality Control Manager

NSC

June 21, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners

Resin Type: DHDA 5500

Project:

Order Number: 799-55

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. Moisture content was determined using an air circulating oven set at 100°C. The average test results are reported below.

Resin Blend Number	0772	5172	5059
Melt Flow Index (g/10 min)	0.52	0.59	0.54
Density (g/cm ³)	0.944	0.944	0.945
Carbon Black Content (percent)	2.21	2.30	2.48
Moisture Content (percent)	0.02	0.03	0.03

Jane Allen
Quality Control Manager

NSC

June 21, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners

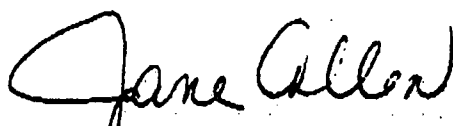
Resin Type: DHDA 5500

Project:

Order Number: 799-55

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. Moisture content was determined using an air circulating oven set at 100°C. The average test results are reported below.

Resin Blend Number 0774

Melt Flow Index 0.50
(g/10 min)Density 0.944
(g/cm³)Carbon Black Content 2.20
(percent)Moisture Content 0.02
(percent)Jane Allen
Quality Control Manager



Recd. 9-22-89 G. Gungor

National Seal Company

Corporate Office

1255 Monmouth Blvd.
P.O. Box 1448
Galesburg, IL 61402-1448
800/323-3820
309/343-3418
FAX 309/343-1536

September 8, 1989

Mr. Michael Snow
Crest-Liners, Inc.
P.O. Box 9382
Salt Lake City, UT 84109

Dear Mr. Snow,

Please find enclosed the certifications for the 40 mil HDPE, shipped September 6, 1989, to Blanding, Utah (799-56) and the 60 mil HDPE, shipped September 8, 1989, to St. George, Utah (799-59).

If you have any questions, please feel free to call.

Very truly yours,

NATIONAL SEAL COMPANY

A handwritten signature in cursive script that reads 'Jane Allen'.

Jane Allen
Quality Control Manager

JA/ja

September 8, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Resin Type: DHDA 5500

Project: Umetco Minerals

Order Number: 799-56

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	4960	4959	0674
Melt Flow Index (g/10 min)	0.43	0.48	0.53
Density (g/cm ³)	0.945	0.945	0.945
Carbon Black Content (percent)	2.28	2.32	2.14



Jane Allen
Quality Control Manager

September 8, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Resin Type: DHDA 5500

Project:

Order Number: 799-59

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	0837	0827
Melt Flow Index (g/10 min)	0.50	0.50
Density (g/cm ³)	0.945	0.945
Carbon Black Content (percent)	2.23	2.29



Jane Allen
Quality Control Manager

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Ship Date: September 8, 1989

Project:

Number of Rolls Shipped: 9

Order Number: 799-59

Nominal Thickness: 60 mil

We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

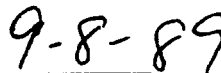
Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	57 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2



Jane Allen
Quality Control Manager



Date

September 8, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 9

Project:

Number of Rolls Tested: 5

Order Number: 799-59

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		Panel 1 U6L-0837-H0508	Panel 8 U6L-0827-H2709	Panel 6 U6L-0827-H2711
Thickness (mils)		61.6	61.1	61.2
Stress at Yield (psi)	MD	2480	2500	2480
	TD	2510	2540	2510
Stress at Break (psi)	MD	5010	4710	4900
	TD	5050	4870	4860
Strain at Yield (percent)	MD	17.1	16.8	17.9
	TD	15.9	16.4	16.6
Strain at Break (percent)	MD	926	883	905
	TD	966	955	958
Carbon Black Dispersion		A1	A1	A1
Dimensional Stability	MD	-0.8	-0.4	-0.8
	TD	0.0	0.0	0.0



Jane Allen
Quality Control Manager

September 8, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

(Page 2)

Roll Number		Panel 4 U6L-0827-H2801	Panel 2 U6L-0827-H2803
Thickness (mils)		60.9	60.6
Stress at Yield (psi)	MD	2480	2510
	TD	2600	2530
Stress at Break (psi)	MD	4670	4530
	TD	4870	4860
Strain at Yield (percent)	MD	17.6	17.2
	TD	16.0	16.1
Strain at Break (percent)	MD	871	845
	TD	944	936
Carbon Black Dispersion		A1	A1
Dimensional Stability	MD	-0.8	-0.4
	TD	0.0	0.0

Roll Number

Thickness (mils)

Stress at Yield (psi) MD

TD

Stress at Break (psi) MD

TD

Strain at Yield (percent) MD

TD

Strain at Break (percent) MD

TD

Carbon Black Dispersion

Dimensional Stability MD

TD

11. 01. 89 03:57 PM * CREST-LINE INC UT P14
11. 01. 89 03:41 PM * NATIONAL SEAL P06

September 11, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

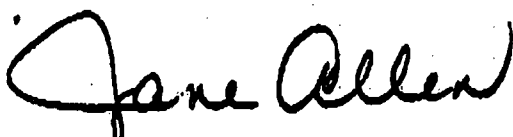
Resin Type: DHDA 5500

Project: Hacia Mining

Order Number: 799-59

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	0838	0832	0827
Melt Flow Index (g/10 min)	0.49	0.50	0.50
Density (g/cm ³)	0.944	0.945	0.945
Carbon Black Content (percent)	2.21	2.26	2.29



Jane Allen
Quality Control Manager

11. 01. 89 03:57 PM * CREST-LINE INC UT P13
11. 01. 89 03:41 PM * NATIONAL SEAL P07

September 11, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

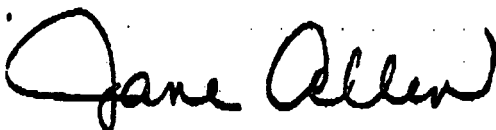
Resin Type: DHDA 5500

Project: Hecla Mining

Order Number: 799-59

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	5178	0837
Melt Flow Index (g/10 min)	0.56	0.50
Density (g/cm ³)	0.944	0.945
Carbon Black Content (percent)	2.40	2.23



Jane Allen
Quality Control Manager

September 11, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 9

Project: Hecia Mining

Number of Rolls Tested:

Order Number: 799-59

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		Panel 17 U6L-0832-G2912	Panel 12 U6L-0837-H0507	Panel 13 U6L-0827-H2707
Thickness (mils)		61.2	61.6	61.1
Stress at Yield (psi)	MD	2500	2480	2490
	TD	2490	2510	2570
Stress at Break (psi)	MD	4930	5010	4490
	TD	4830	5050	4650
Strain at Yield (percent)	MD	17.0	17.1	17.0
	TD	15.5	15.9	15.9
Strain at Break (percent)	MD	886	926	876
	TD	925	966	906
Carbon Black Dispersion		A1	A1	A1
Dimensional Stability	MD	-0.8	-0.8	-0.4
	TD	0.0	0.0	0.0



Jane Allen
Quality Control Manager

11. 01. 89 03:57 PM

11. 01. 89 03:41 PM

* CREST-LINE INC UT

* NATIONAL SEAL

P12

P08

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Project: Hecla Mining

Order Number: 799-59

Ship Date: September 8, 1989

Number of Rolls Shipped: 9

Nominal Thickness: 60 mil


We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	57 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2


Jane Allen
Quality Control Manager

9-11-89
Date

September 11, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS
(Page 2)

Roll Number	Panel 10 U6L-0827-H2804	
Thickness (mils)		60.6
Stress at Yield (psi)	MD	2510
	TD	2560
Stress at Break (psi)	MD	4550
	TD	4860
Strain at Yield (percent)	MD	17.2
	TD	16.1
Strain at Break (percent)	MD	845
	TD	936
Carbon Black Dispersion		A1
Dimensional Stability	MD	-0.4
	TD	0.0

Roll Number	
Thickness (mils)	
Stress at Yield (psi)	MD
	TD
Stress at Break (psi)	MD
	TD
Strain at Yield (percent)	MD
	TD
Strain at Break (percent)	MD
	TD
Carbon Black Dispersion	
Dimensional Stability	MD
	TD

September 15, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Resin Type: DHDA 5500

Project: Hecla Mining

Order Number: 799-59

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	5190	0828	5448
Melt Flow Index (g/10 min)	0.51	0.49	0.50
Density (g/cm ³)	0.944	0.945	0.945
Carbon Black Content (percent)	2.34	2.36	2.32



Jane Allen
Quality Control Manager

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Project: Hecia Mining

Order Number: 799-59

Ship Date: September 12, 1989

Number of Rolls Shipped: 9

Nominal Thickness: 60 mil

We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.05% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	57 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2



Jane Allen
Quality Control Manager

9-15-89

Date

September 15, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 9

Project: Hecla Mining

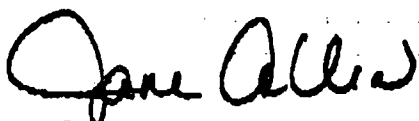
Number of Rolls Tested: 5

Order Number: 799-59

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		Panel 27 UGL-5448-10802	Panel 26 UGL-0820-11002	Panel 22 UGL-5190-11004
Thickness (mils)		60.2	60.6	60.6
Stress at Yield (psi)	MD	2580	2610	2490
	TD	2670	2650	2530
Stress at Break (psi)	MD	4580	4550	4410
	TD	4630	5060	4870
Strain at Yield (percent)	MD	17.7	17.7	16.4
	TD	17.2	16.7	16.1
Strain at Break (percent)	MD	874	869	843
	TD	900	985	940
Carbon Black Dispersion		A1	A1	A1
Dimensional Stability	MD	-1.1	-1.2	-0.8
	TD	+0.1	-0.4	0.0



Jane Allen
Quality Control Manager

11. 01. 89 03:57 PM * CREST-LINE INC UT P08
 11. 01. 89 03:41 PM *NATIONAL SEAL P14

September 15, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS
 (Page 2)

		Panel 21 U6L-5190-I1006	Panel 19 U6L-5190-I1014
Roll Number			
Thickness (mils)		60.6	60.3
Stress at Yield (psi)	MD	2500	2450
	TD	2540	2540
Stress at Break (psi)	MD	4720	4650
	TD	4800	4630
Strain at Yield (percent)	MD	16.9	17.8
	TD	16.1	16.1
Strain at Break (percent)	MD	874	894
	TD	928	912
Carbon Black Dispersion		A1	A1
Dimensional Stability	MD	-0.4	-0.4
	TD	0.0	0.0

Roll Number	
Thickness (mils)	
Stress at Yield (psi)	MD
	TD
Stress at Break (psi)	MD
	TD
Strain at Yield (percent)	MD
	TD
Strain at Break (percent)	MD
	TD
Carbon Black Dispersion	
Dimensional Stability	MD
	TD

NSC

National Seal Company

Corporate Office
1255 Monmouth Blvd.
P.O. Box 1448
Galesburg, IL 61402-1448
800/323-3820
309/343-3418
FAX 309/343-1538

September 25, 1989

Mr. Michael Snow
Crest-Liners, Inc.
P.O.B. 9382
Salt Lake City, UT 84109

Dear Mr. Snow,

Please find enclosed the certifications for the 60 mil HDPE, shipped September 22, 1989, to St. George, Utah (799-59).

If you have any questions, please feel free to call.

Very truly yours,

NATIONAL SEAL COMPANY



Jane Allen
Quality Control Manager

JA/ja

10. 18. 89 03:12 PM
10. 18. 89 02:32 PM *NATIONAL

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Ship Date: September 22, 1989

Project: Hecla Mining

Number of Rolls Shipped: 3

Order Number: 799-59

Nominal Thickness: 60 mil


We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	57 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2


Jane Allen
Quality Control Manager

9-25-89
Date

September 25, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

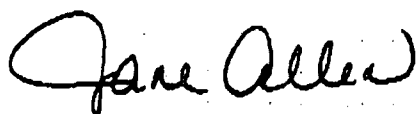
Resin Type: DHDA 5500

Project: Hecla Mining

Order Number: 799.59

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	0828	0836	0838
Melt Flow Index (g/10 min)	0.49	0.52	0.49
Density (g/cm ³)	0.945	0.944	0.944
Carbon Black Content (percent)	2.36	2.24	2.21



Jane Allen
Quality Control Manager

September 25, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 3

Project: Hecla Mining

Number of Rolls Tested: 1

Order Number: 799-59

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

not on site

Panel 29

Roll Number	U6L-0836-H0811	
Thickness (mils)		62.3
Stress at Yield (psi)	MD	2370
	TD	2650
Stress at Break (psi)	MD	4220
	TD	4730
Strain at Yield (percent)	MD	16.5
	TD	15.4
Strain at Break (percent)	MD	857
	TD	944
Carbon Black Dispersion		A1
Dimensional Stability	MD	-0.6
	TD	0.2

Jane Allen
Quality Control Manager

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Ship Date: September 22, 1989

Project: Hecla Mining

Number of Rolls Shipped: 3

Order Number: 799-59

Nominal Thickness: 60 mil

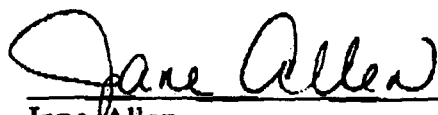
We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	57 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2



Jane Allen
Quality Control Manager

9-25-89

Date

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Ship Date: October 30, 1989

Project: Hecla Mining

Number of Rolls Shipped: 1

Order Number: 799-59A

Nominal Thickness: 60 mil


We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	57 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2


Jane Allen
Quality Control Manager

10-31-89
Date

October 31, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 1

Project: Hecla Mining

Number of Rolls Tested: 1

Order Number: 799-59A

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		U6L-5450-J1704
Thickness (mils)		60.4
Stress at Yield (psi)	MD	2510
	TD	2560
Stress at Break (psi)	MD	4560
	TD	4810
Strain at Yield (percent)	MD	17.5
	TD	15.7
Strain at Break (percent)	MD	848
	TD	912
Carbon Black Dispersion		A1
Dimensional Stability	MD	-1.2
	TD	0.0

Jane Allen
Quality Control Manager

October 31, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Resin Type: DHDA 5500

Project: Hecla Mining

Order Number: 799-59A

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	5450
--------------------	------

Melt Flow Index (g/10 min)	0.50
-------------------------------	------

Density (g/cm ³)	0.945
---------------------------------	-------

Carbon Black Content (percent)	2.28
-----------------------------------	------



Jane Allen
Quality Control Manager

To: Mr. Gill Jaramillo

From: Jane Allen

Re: Hecla Mining

Date: November 2, 1989

The roll numbers you did not receive tests on were from the same resin blends as other rolls you received test reports, with the exception of two of the blends which are reported on the following page.

Please be aware all National Seal Liners are first quality and 100% virgin resin.

For Identification purposes I am sending a roll identification explanation code.

JA/ja

November 2, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

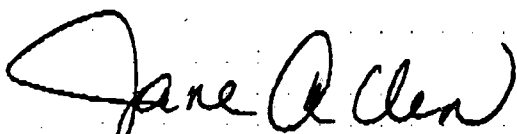
Number of Rolls Tested: 2

Project: Hecla Mining

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		U6L-0838-H0603	U6L-5178-H0906
Thickness (mils)		60.5	60.9
Stress at Yield (psi)	MD	2500	2510
	TD	2500	2570
Stress at Break (psi)	MD	4930	4530
	TD	5040	4810
Strain at Yield (percent)	MD	17.4	17.1
	TD	15.2	16.5
Strain at Break (percent)	MD	899	860
	TD	966	935
Carbon Black Dispersion		A1	A1
Dimensional Stability	MD	-1.2	-0.4
	TD	0.2	0.0



Jane Allen
Quality Control Manager

November 3, 1989

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Resin Type: DHDA 5500

Project: Hecla Mining

Order Number: 799-59

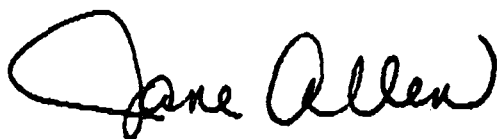
The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	5526
--------------------	------

Melt Flow Index (g/10 min)	0.46
-------------------------------	------

Density (g/cm ³)	0.944
---------------------------------	-------

Carbon Black Content (percent)	2.20
-----------------------------------	------



Jane Allen
Quality Control Manager

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Ship Date: November 2 & 3, 1989

Project: Hecla Mining

Number of Rolls Shipped: 18

Order Number: 799-59

Nominal Thickness: 60 mil

We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	58.2 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2


Jane Allen
Quality Control Manager

11-03-89
Date

November 3, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 18

Project: Hecla Mining

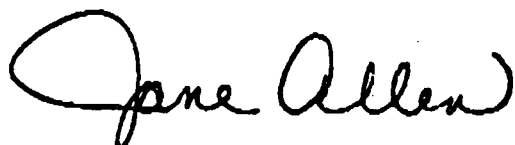
Number of Rolls Tested: 9

Order Number: 799-59

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		U6L-5526-J3106	U6L-5526-J3104	U6L-5525-J3001
Thickness (mils)		61.0	61.7	61.5
Stress at Yield (psi)	MD	2390	2430	2430
	TD	2440	2490	2540
Stress at Break (psi)	MD	4680	4650	4630
	TD	4640	4760	4800
Strain at Yield (percent)	MD	17.4	18.1	17.6
	TD	16.1	17.5	16.8
Strain at Break (percent)	MD	886	900	905
	TD	925	944	963
Carbon Black Dispersion		A1	A1	A1
Dimensional Stability	MD	-0.8	-0.8	-0.5
	TD	-0.2	0.0	0.2

Jane Allen
Quality Control Manager

November 3, 1989

GEOMEMBRANE CERTIFICATE OF ANALYSIS (Page 2)

Roll Number		U6L-5526-J3005	U6L-5526-J3007	U6L-5526-J3011
Thickness (mils)		60.3	60.8	60.4
Stress at Yield (psi)	MD	2420	2400	2440
	TD	2530	2480	2500
Stress at Break (psi)	MD	4660	4440	4600
	TD	4910	4790	4800
Strain at Yield (percent)	MD	19.3	19.7	18.9
	TD	17.3	17.8	17.4
Strain at Break (percent)	MD	868	825	863
	TD	947	936	936
Carbon Black Dispersion		A1	A1	A1
Dimensional Stability	MD	-0.8	-0.8	-0.8
	TD	0.0	0.2	-0.2

Roll Number		U6L-5526-J3102	U6L-5526-J3017	U6L-5526-J3013
Thickness (mils)		61.2	61.0	60.8
Stress at Yield (psi)	MD	2510	2470	2430
	TD	2530	2540	2540
Stress at Break (psi)	MD	4660	4810	4660
	TD	4880	4710	4860
Strain at Yield (percent)	MD	18.3	17.7	19.3
	TD	16.8	16.7	16.9
Strain at Break (percent)	MD	905	934	871
	TD	977	960	956
Carbon Black Dispersion		A1	A1	A1
Dimensional Stability	MD	-0.8	-0.8	-1.3
	TD	-0.1	-0.2	-0.3

01.09.90 04:55 PM * CREST-LINE INC UT P02
01.09.90 04:23 PM *NATIONAL SEAL P03

NSC

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Ship Date:

Project: Hecla Mining

Number of Rolls Shipped: 5

Order Number: 799-59

Nominal Thickness: 60 mil

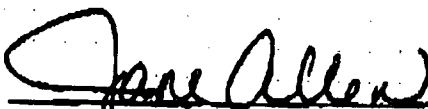
We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	58.2 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2



Jane Allen
Quality Control Manager

1-09-90
Date

01.09.90 04:55 PM * CREST-LINE INC UT P03

01.09.90 04:23 PM *NATIONAL SEAL P02

NSC

January 9, 1990

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

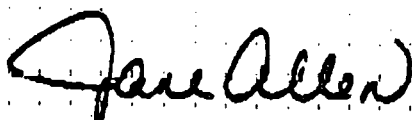
Resin Type: DHDA 5500

Project: Hecla Mining

Order Number: 799-59

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	5521	0804
Melt Flow Index (g/10 min)	0.46	0.56
Density (g/cm ³)	0.943	0.944
Carbon Black Content (percent)	2.09	2.37



Jane Allen
Quality Control Manager

NSC

January 9, 1990

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 5

Project: Hecia Mining

Number of Rolls Tested: 3

Order Number: 799-59

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		U6L-5521-12312 ^{Good}	U6L-5521-12314 ^{Good}	U6L-0804-G1409 ^{Good}
Thickness (mils)		60.4	60.2	61.1
Stress at Yield (psi)	MD	2580	2520	2330
	TD	2640	2640	2380
Stress at Break (psi)	MD	4860	4510	4880
	TD	4850	4470	4650
Strain at Yield (percent)	MD	17.8	17.1	17.4
	TD	16.9	16.8	16.6
Strain at Break (percent)	MD	884	841	920
	TD	947	892	894
Carbon Black Dispersion		A1	A1	A1
Dimensional Stability	MD	-1.2	-1.2	-0.9
	TD	-0.2	-0.2	0.2



Jane Allen
Quality Control Manager

NSC

GEOMEMBRANE CERTIFICATION

Customer: Crest-Liners, Inc.

Ship Date:

Project: Hecla Mining

Number of Rolls Shipped: 2

Order Number:

Nominal Thickness: 60 mil

We hereby certify that the resin and polyethylene geomembrane for the above identified shipment, meets or exceeds National Seal Company's specifications, attached, and NSF Standard 54 specifications for HDPE geomembrane. The tests listed below in the resin specifications have been performed on each batch of resin. The tests listed below in the geomembrane specifications have been performed at least every 10,000 pounds of geomembrane.

RESIN SPECIFICATIONS

Melt Flow Index	1.0 Maximum
Density	0.94 Minimum
Carbon Black Content	2.0 to 3.0
Moisture Content	0.08% Maximum

GEOMEMBRANE SPECIFICATIONS

Thickness	58.2 mil Minimum
Stress at Yield	2200 psi Minimum
Stress at Break	3800 psi Minimum
Strain at Yield	13% Minimum
Strain at Break	600% Minimum
Carbon Black Dispersion	A1 or A2

NSC

January 23, 1990

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer: Crest-Liners, Inc.

Number of Rolls Shipped: 2

Project: Hecla Mining

Number of Rolls Tested: 2

Order Number:

Nominal Thickness: 60 mil

The geomembrane referenced above was tested for thickness, tensile properties, carbon black dispersion and dimensional stability. Thickness was tested according to ASTM D 1593, paragraph 9.1.3. Tensile properties were tested according to ASTM D 638 using a type IV dumbbell specimen, a strain rate of two inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 3015 and rated according to the ASTM D 2663 classification chart when viewed under 100X magnification. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. The average test results are reported below.

Roll Number		U6L-5136-D2711	U6L-5133-D2905
Thickness (mils)		59.3	62.0
Stress at Yield (psi)	MD	2450	2270
	TD	2590	2400
Stress at Break (psi)	MD	4580	4480
	TD	4770	4790
Strain at Yield (percent)	MD	16.7	16.3
	TD	16.9	15.6
Strain at Break (percent)	MD	709	840
	TD	967	980
Carbon Black Dispersion		A1	A1
Dimensional Stability	MD	-0.2	-0.4
	TD	0.0	0.2

Jane Allen
Quality Control Manager

NSC

January 23, 1990

POLYETHYLENE RESIN CERTIFICATE OF ANALYSIS

Customer: Creat-Liners, Inc.

Resin Type: DHDA 5500

Project: Hecla Mining

Order Number:

The polyethylene resin referenced above was tested for melt flow index, density, carbon black content and moisture content. Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 1505. Carbon black content was determined according to ASTM D 1603. The average test results are reported below.

Resin Blend Number	3133	3136
Melt Flow Index (g/10 min)	0.49	0.51
Density (g/cm ³)	0.944	0.944
Carbon Black Content (percent)	2.30	2.30

Jane Allen
Quality Control Manager

APPENDIX D
CONFORMANCE TEST
RESULTS OF INSTALLED
GEOMEMBRANE



Precision Laboratories

RECEIVED
DEC 11 1989

December 6, 1989

Mr. Mike Hlinko
STEFFEN, ROBERTSON, KIRSTEN
3232 South Vance St., Suite 210
Lakewood, CO 80227

Dear Mr. Hlinko:

Thank you for consulting Precision Laboratories for your material testing needs.

Enclosed please find the laboratory report for the testing of the one (1) roll of HDPE Rod received December 4, 1989.

If you have any questions or if I may be of further service, please do not hesitate to call.

Sincerely,

PRECISION LABORATORIES

Abraham Kader
Laboratory Supervisor

Enclosure

TABLE 3. CARBON CONTENT (PERCENT)
HDPE Rod
HECLA Mine Site/APEX Project # 22201
For: STEFFEN, ROBERTSON, KIRSTEN
(Precision Reference: 890687)

NO ID Precision C#09364

2.31
2.37

Avg: 2.34
SD: 0.04

TABLE 1. MATERIAL PROPERTY SUMMARY
HDPE Rod
HECLA Mine Site/APEX Project # 22201
For: STEFFEN, ROBERTSON, KIRSTEN
(Precision Reference: 890687)

PROPERTY

NO ID
C#09364

Melt Flow Index
(grams/10 min)

0.4628

Carbon Black Content
(percent)

2.34

TABLE 2. MELT FLOW INDEX (GRAMS/10 MIN)
HDPE Rod
HECLA Mine Site/APEX Project # 22201
For: STEFFEN, ROBERTSON, KIRSTEN
(Precision Reference: 890687)

NO ID Precision C#09364

0.4655
0.4588
0.4642

Avg: 0.4628
SD: 0.0036



Precision Laboratories

January 29, 1990

VERIFICATION OF MATERIAL PROPERTIES

High Density Polyethylene Liner

For: STEFFEN ROBERTSON AND KIRSTEN

HECLA Mining Company Apex Unit

(Project #22201 Precision Reference: 900009)

INTRODUCTION

Precision Laboratories performed physical testing on two (2) high density polyethylene liner samples for STEFFEN ROBERTSON AND KIRSTEN of Lakewood, CO. The samples were delivered to the laboratory on January 18, 1990 by Federal Express and were identified as follows:

Sample #3002

Sample #3004

Precision C#09604

Precision C#09605

TEST PROCEDURES

The samples were tested for thickness, tensile properties, density, and carbon black content. The thickness of the liner sample was determined in accordance with ASTM D1593, paragraph 9.1.3. Tensile property determinations were made in accordance with ASTM D638 using a type IV specimen and a strain rate of 2 inches per minute. Density was determined in accordance with ASTM D1505. Carbon black content was determined in accordance with ASTM D1603.

TEST RESULTS

The test results are summarized on Table 1. Individual test results are reported on Tables 2 through 5. The units in which the data are reported are included on the tables.

PRECISION LABORATORIES

Chandrika D. Patel
Quality Assurance

TABLE 1. MATERIAL PROPERTY SUMMARY
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
HECLA Mining Company Apex Unit
(Project #22201 Precision Reference: 900009)

<u>PROPERTY</u>		<u>Sample #3002</u> <u>C#09604</u>	<u>Sample #3004</u> <u>C#09605</u>
Thickness (mils)		63.5	61.7
Tensile Properties:			
Stress at Yield (ppi)	MD	172	164
	TD	167	166
Stress at Break (ppi)	MD	273	285
	TD	275	289
Elongation at Yield (percent)	MD	16.2	17.0
	TD	18.2	17.2
Elongation at Break (percent)	MD	838	875
	TD	802	941
Density (grams/cm ³)		0.9414	0.9413
Carbon Black Content (percent)		2.17	2.50



TABLE 2. INDIVIDUAL TENSILE PROPERTIES
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
 HECLA Mining Company Apex Unit
 (Project #22201 Precision Reference: 900009)

Sample #3002 Precision C#09604

MACHINE DIRECTION

	Stress at Yield (ppi)	Stress at Break (ppi)	Elongation at Yield (%)	Elongation at Break (%)
	165	225	17.2	640
	176	303	16.8	965
	169	258	15.3	734
	175	303	14.7	967
	174	277	16.9	885
Avg:	172	273	16.2	838
SD:	5	33	1.1	146

TRANSVERSE DIRECTION

	Stress at Yield (ppi)	Stress at Break (ppi)	Elongation at Yield (%)	Elongation at Break (%)
	163	299	19.2	894
	166	271	17.7	787
	166	278	19.2	807
	168	257	18.5	740
	172	272	16.2	782
Avg:	167	275	18.2	802
SD:	3	15	1.3	57

TABLE 2. Page 1.



Precision Laboratories

TABLE 2. (CON'T) INDIVIDUAL TENSILE PROPERTIES**High Density Polyethylene Liner****For: STEFFEN ROBERTSON AND KIRSTEN****HECLA Mining Company Apex Unit****(Project #22201 Precision Reference: 900009)****Sample #3004 Precision C#09605****MACHINE DIRECTION**

	Stress at Yield (ppi)	Stress at Break (ppi)	Elongation at Yield (%)	Elongation at Break (%)
	165	272	15.3	846
	166	277	15.1	852
	159	294	18.5	900
	168	282	16.9	861
	164	298	19.2	916
Avg:	164	285	17.0	875
SD:	3	11	1.8	31

TRANSVERSE DIRECTION

	Stress at Yield (ppi)	Stress at Break (ppi)	Elongation at Yield (%)	Elongation at Break (%)
	173	292	15.6	930
	168	293	16.9	959
	160	267	19.2	882
	164	287	17.0	930
	165	305	17.4	1004
Avg:	166	289	17.2	941
SD:	5	14	1.3	45

TABLE 2. Page 2.**Precision Laboratories**

TABLE 3. THICKNESS (MILS)
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
HECLA Mining Company Apex Unit
(Project #22201 Precision Reference: 900009)

Sample #3002 Precision C#09604

63.2
64.0
63.5
63.3
63.8
62.8
63.5
63.5
63.3
63.9

Avg: 63.5
SD: 0.4

Sample #3004 Precision C#09605

61.0
61.3
61.2
61.9
61.7
61.9
61.6
61.6
61.7
63.0

Avg: 61.7
SD: 0.6



Precision Laboratories

TABLE 4. DENSITY (GMS/CM³)
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
HECLA Mining Company Apex Unit
(Project #22201 Precision Reference: 900009)

Sample #3002 Precision C#09604

0.9411
0.9416
0.9416

Avg: 0.9414
SD: 0.0003

Sample #3004 Precision C#09605

0.9411
0.9416
0.9411

Avg: 0.9413
SD: 0.0003



Precision Laboratories

TABLE 5. CARBON BLACK CONTENT(PERCENT)
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
HECLA Mining Company Apex Unit
(Project #22201 Precision Reference: 900009)

Sample #3002 Precision C#09604

2.17

2.17

Avg: 2.17

SD: 0.00

Sample #3004 Precision C#09605

2.83

2.17

Avg: 2.50

SD: 0.47



Precision Laboratories



Precision Laboratories

January 29, 1990

VERIFICATION OF MATERIAL PROPERTIES

High Density Polyethylene Liner

For: STEFFEN ROBERTSON AND KIRSTEN

HECLA Mining Company Apex Unit

(Project #22201 Precision Reference: 900016)

INTRODUCTION

Precision Laboratories performed physical testing on one (1) high density polyethylene liner sample for STEFFEN ROBERTSON AND KIRSTEN of Lakewood, CO. The sample was delivered to the laboratory on January 25, 1990 by UPS and was identified as follows:

Sample #1409

Precision C#09622

TEST PROCEDURES

The samples were tested for thickness, tensile properties, density, and carbon black content. The thickness of the liner sample was determined in accordance with ASTM D1593, paragraph 9.1.3. Tensile property determinations were made in accordance with ASTM D638 using a type IV specimen and a strain rate of 2 inches per minute. Density was determined in accordance with ASTM D1505. Carbon black content was determined in accordance with ASTM D1603.

TEST RESULTS

The test results are summarized on Table 1. Individual test results are reported on Tables 2 through 5. The units in which the data are reported are included on the tables.

PRECISION LABORATORIES

Chandrika D. Patel
Quality Assurance

TABLE 1. MATERIAL PROPERTY SUMMARY
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
HECLA Mining Company Apex Unit
(Project #22201 Precision Reference: 900016)

<u>PROPERTY</u>		<u>Sample #1409</u> <u>C#09622</u>
Thickness (mils)		63.0
Tensile Properties:		
Stress at Yield (ppi)	MD	171
	TD	170
Stress at Break (ppi)	MD	292
	TD	275
Elongation at Yield (percent)	MD	17.6
	TD	16.5
Elongation at Break (percent)	MD	887
	TD	890
Density (grams/cm ³)		0.9478
Carbon Black Content (percent)		2.50



TABLE 2. INDIVIDUAL TENSILE PROPERTIES
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
 HECLA Mining Company Apex Unit
 (Project #22201 Precision Reference: 900016)

Sample #1409 Precision C#09622

MACHINE DIRECTION

	Stress at Yield (ppi)	Stress at Break (ppi)	Elongation at Yield (%)	Elongation at Break (%)
	169	285	16.9	862
	169	299	15.1	900
	172	289	19.2	872
	172	287	19.2	872
	172	300	17.7	927
Avg:	171	292	17.6	887
SD:	2	7	1.7	27

TRANSVERSE DIRECTION

	Stress at Yield (ppi)	Stress at Break (ppi)	Elongation at Yield (%)	Elongation at Break (%)
	170	279	16.1	910
	173	262	16.9	854
	171	261	17.7	837
	166	292	14.8	945
	172	283	16.9	904
Avg:	170	275	16.5	890
SD:	3	14	1.1	44

TABLE 3. THICKNESS (MILS)
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
HECLA Mining Company Apex Unit
(Project #22201 Precision Reference: 900016)

Sample #1409 Precision C#09622

62.9
63.0
63.0
63.1
63.2
62.8
62.9
63.3
63.0
63.1

Avg: 63.0
SD: 0.1



Precision Laboratories

TABLE 4. DENSITY (GMS/CM³)
High Density Polyethylene Liner
For: STEFFEN ROBERTSON AND KIRSTEN
HECLA Mining Company Apex Unit
(Project #22201 Precision Reference: 900016)

Sample #1409 Precision C#09622

0.9481
0.9476
0.9476

Avg: 0.9478
SD: 0.0003

TABLE 5. CARBON BLACK CONTENT(PERCENT)

High Density Polyethylene Liner

For: STEFFEN ROBERTSON AND KIRSTEN

HECLA Mining Company Apex Unit

(Project #22201 Precision Reference: 900016)

Sample #1409 Precision C#09622

2.49

2.51

Avg: 2.50

SD: 0.01



Precision Laboratories

APPENDIX E
DESTRUCTIVE TEST RESULTS
POND 3-A AND 1-A/1-B
LINERS

TABLE B.1

DESTRUCTIVE SAMPLES PRIMARY LINER
POND 3-A

<u>SAMPLE NO.</u>	<u>SEAM NO.</u>	<u>LOCATION</u>	<u>PASS/FAIL (DIF)</u>
1-P	2-E	24' from anchor trench	P
2-P	5-E	14' from anchor trench	P
3-P	8-E	56' from anchor trench	P
4-P	13-E	86' from anchor trench	P
5-P	18-E	59' from anchor trench	P
6-P	22-E	36' from anchor trench	P
7-P	27-W	21' from anchor trench	P
8-P	23-W	47' from anchor trench	P
9-P	19-W	86' from anchor trench	P
10-P	15-W	125' from anchor trench	P
11-P	11-W	15' from anchor trench	P
12-P	7-W	44' from anchor trench	P
13-P	22-W	96' from anchor trench	F
14-P	18-W	61' from anchor trench	P
15-P	-W	20' from anchor trench	P
16-P	10-W	87' from anchor trench	P
17-P	4-W	57' from anchor trench	P
18-P	2-S	38' from anchor trench	P
19-P	10-S	82' from anchor trench	P
20-P	Common Seam at Pond Center Line	8' south of field seams, 3-W and 3-E	P
21-P	29-E	23' from anchor trench	P
22-P	32-E	61' from anchor trench	P
23-P	33-W	104' from anchor trench	P
24-P	19-W	100' from anchor trench	P
25-P	33-W	50' from anchor trench	P
26-P	9-N	21' from anchor trench	P
27-P	68-E	104' from anchor trench	P
28-P	65-E	67' from anchor trench	P
29-P	62-E	54' from anchor trench	P
30-P	58-E	42' from anchor trench	P
31-P	66-W	35' from anchor trench	P
32-P	62-W	99' from anchor trench	P
33-P	42-E	99' from anchor trench	P
34-P	46-E	64' from anchor trench	P
35-P	49-E	107' from anchor trench	P
36-P	52-E	84' from anchor trench	F
37-P	55A-E	53' from anchor trench	P
38-P	36-W	77' from anchor trench	P
39-P	41-W	35' from anchor trench	P
40-P	44-W	5' from anchor trench	P
41-P	59-W	78' from anchor trench	P
42-P	50-W	87' from anchor trench	P

Table B.1
Page Two

<u>SAMPLE NO.</u>	<u>SEAM NO.</u>	<u>LOCATION</u>	<u>PASS/FAIL (DIF)</u>
43-P	53-W	121' from anchor trench	P
44-P	55A-W	34' from anchor trench	P
45-P	Common Seam at Center Line 56 B-W and 57 A-E	6' north of FS/56 B-W	P

<u>RESAMPLE SAMPLE NO.</u>	<u>SEAM NO.</u>	<u>LOCATION</u>	<u>PASS/FAIL (DIF)</u>
9-P	19-W	86' from anchor trench	*
13-P-A	22-W	86' from anchor trench	P
13-P-B	22-W	106' from anchor trench	P

Remarks: *All seams produced by this hotshoe were tested and found deficient on this date. Seams 5-W, 9-W, 10-W, 11-W, 12-W, 13-W, 14-W and 15-W through 24-W were sampled. Seams 16-W, 18-W, 19-W, 21-W and 22-W failed. All seams produced on this date were removed, panels were shifted and realigned then rewelded. All seams were retested and found to be within specification limits.

TABLE B.2
DESTRUCTIVE SAMPLES SECONDARY LINER
POND 3-A

<u>SAMPLE NO.</u>	<u>SEAM NO.</u>	<u>LOCATION</u>	<u>PASS/FAIL</u> <u>(DIF)</u>
1	15-E		F
2	5-W		P
3	22-E		P
4	29-E		F
5	37-E	20' west of anchor trench	F
6	44-E	10' west of anchor trench	F
7	13-W	25' west of anchor trench	F
8	52-E		P
9	59-E		P
10	66-E		P
11	18-W		F
12	26-W		P
13	33-W		P
14	41-W		P
15	49-W		P
16	57-W		P
18	8-N		P
19	9-S		P
20	24-S	10' north of anchor trench	F
21	3-B		P
22	3-B		P
23	4-B		P
24	4-B		P
25	5-B		P
26	5-B		P
27	6-B		P
28	6-B		P
29	7-B		P
30	7-B		P
31	8-B		P
32	8-B		P
33	9-B		P
34	9-B		F
35	10-B		P
36	11-B		P
37	12-B		P
38	13-B		P
39	13-B		P
40	17-N		P

RETESTS

<u>SAMPLE NO.</u>	<u>SEAM NO.</u>	<u>LOCATION</u>	<u>PASS/FAIL (DIF)</u>
1-C	15-E	10' west of orig. test	P
4-B	29-E	10' east of orig. test	P
4-C	29-E	10' west of orig. test	P
5-A	37-E	10' east of orig. test	P
5-B	37-E	20' east of orig. test	P
		at anchor trench	
5-C	37-E	10' west of orig. test	F
5-CC	35-E	10' west of anchor trench	P
6-A	44-E	At anchor trench	P
6-C	44-E	10' west of orig. test	F
6-CC	44-E	20' west of orig. test	F
6-CCC	44-E	Seam was trimmed, no sample possible	-
6-CCCC	42-E	10' west of anchor trench	F
6-CCCCC	42-E	20' west of anchor trench	F
6-CCCCCC	42-E	30' west of anchor trench	P
7-A	13-W	20' west of orig. test	P
7-B	13-W	10' west of orig. test	F
7-C	13-W	10' east of orig. test	F
7-CC	11-W	10' east of anchor trench	F
7-CCC	11-W	20' east of anchor trench	F
7-CCCC	11-W	30' east of anchor trench	F
7-CCCCC	9-W	10' east of anchor trench	F
NOTE: All seams from 9-W through 13-W were removed and reseamed.			
11-A	18-W	10' west of anchor trench	P
11-C	18-W	10' east of orig. test	P
20-A	24-S	At anchor trench	P
20-C	24-S	10' north of orig. test	P
34-B	9-B	10' north of orig. test	P
34-C	9-B	10' south of orig. test	P

TABLE B.3
DESTRUCTIVE SAMPLES PRIMARY LINER
POND 1A/1B

<u>SAMPLE NO.</u>	<u>SEAM NO.</u>	<u>LOCATION</u>	<u>PASS/FAIL</u> <u>(DIF)</u>
1	4-E	10' west of anchor trench	P
2	8-E	92' east of E/W seam	P
3	11-E	74' east of E/W seam	P
4	15-E	19' east of E/W seam	P
5	19-E	29' east of E/W seam	P
6	3-W	69' west of E/W seam	P
7	8-W	36' west of E/W seam	P
8	13-W	60' west of E/W seam	P
9	19-W	48' west of E/W seam	P
10	5-N/W	8' S/W of 3-NW & 5 NW seams	P
11	15-W/15-E	6' north of seam 15-W	P
12	8-S	15' south of 8-S & 1-W seam	P
13	2-S/E	25' S/E of 2-S/E & 1-S/E	P
14	24-W	44' west of seam 24-W & 2-E	P
15	8-N	8' north of 8-N & 26-W seam	P
16	24-E	35' east of E/W seam	P
17	15-N	17' south of anchor trench	P

TABLE B.3
DESTRUCTIVE SAMPLES SECONDARY LINER
POND 1A/1B

<u>SAMPLE NO.</u>	<u>SEAM NO.</u>	<u>LOCATION</u>	<u>PASS/FAIL (DIF)</u>
1	5-E	58' east of E/W seam	P
2	10-E	102' east of E/W seam	P
3	14-E	63' east of E/W seam	P
4	19-E	86' east of E/W seam	P
5	24-E	70' east of E/W seam	P
6	3-W	14' west of E/W seam	P
7	10-W	2' west of E/W seam	P
8	15-W	19' west of E/W seam	P
9	19-W	38' west of E/W seam	P
10	6-S	15' south of 1-W & 6-S seam	P
11	3-S/E	18' S/E of 1-E & 3-S/E seam	P
12	5-S	--	P

STEFFEN ROBERTSON & KIRSTEN

Consulting Engineers

Hecla Mining Co. Project No. 22201

FEATURE Apex Unit

DATE OF SUMMARY 9-28-89 TO 11-2-89

PAGE 1 OF 1

SUMMARY OF FIELD TEST ON COMPACTED FILL

MATERIAL TYPE Subgrade

DATE	TEST NO.	LOCATION	DEPTH ELEV.	PROCTOR SAMPLE NO.	FIELD TEST RESULTS			LAB RESULTS		TYPE OF TEST		PASS OR FAIL	RE-TEST	% COMP. REQD.	ACTUAL % COMP.
					W γ	D γ	F.M.C.	M.D. γ	O.M.C.	N	S				
9-28-89	1	Pond 3-A N/E Quadrant of floor	Sub-grade	Density #1 Grad. #6	147.1	138.5	6.2	141.8	5.8		X	P	--	90	98%
9-28-89	2	Pond 3-A N/W Quadrant of floor	Sub-grade	Density #2 Grad. #7	139.7	134.5	3.9	141.8	5.8		X	P	--	90	95%
9-28-89	3	Pond 3-A S/E Quadrant of floor	Sub-grade	Density #3 Grad. #8	137.0	128.0	7.0	141.8	5.8		X	P	--	90	90%
9-28-89	4	Pond 3-A S/W Quadrant of floor	Sub-grade	Density #4 Grad. #9	149.9	142.9	4.9	141.8	5.8		X	P	--	90	100%
11-2-89	6	Pond 1 A-B 150' from 5th & 50' from East Slope Toe	Sub-grade	Density #6 Grad. #11	144.2	136.9	5.3	141.8	5.8		X	P	--	90	96%
11-2-89	7	Pond 1 A-B 20' from West & 40' from North Slope Toe	Sub-grade	Density #7 Grad. #12	135.4	128.8	5.1	141.8	5.8		X	P	--	90	95%

REMARKS

APPENDIX F
"T" CONNECTION TEST RESULTS

7.0 HDPE PIPE

7.1 Scope

Items of work shall include, but not be limited to, furnishing and placing pipe and protective covering in the immediate vicinity of the pipe within the leak detection sump.

7.2 Excavation

Excavation for HDPE pipe shall be limited to the leak detection riser pipe in the pond. The excavation shall be to the lines and grades shown on the Drawings.

7.3 Materials

The HDPE pipe shall be eight-inch diameter as shown on the Drawings.

7.4 Installation

All HDPE pipes shall be installed in accordance to the lines and grades on the Drawings and to the manufacturer's Specifications. The top section of pipe shall be anchored to the top synthetic liner with an HDPE liner boot and water-proof clamp. The top of the pipe shall extend a minimum of one-ft above the liner crest.

7.5 Perforated Pipe

Perforated pipe within the leak detection sump shall have a maximum size opening of 1/8 inch. Perforation will be placed into the pea gravel in the sump.

TABLE 1. SEAM TEST
 High Density Polyethylene Seam Sample
 For: STEFFEN, ROBERTSON, KIRSTEN
 HECLA MINE SITE/APEX PROJECT # 22201
 (Precision Reference: 890686)

WEDGE WELD Precision C#09362

PEEL ADHESION LBS/IN. WIDTH		DESCRIPTION OF FAILURE
	69	
	<u>88</u>	
AVE:	78	Cohesive Peel, Tunnel at edge
SD:	13	Film Tearing Bond

TABLE 2. SEAM TEST
 High Density Polyethylene Seam Sample
 For: STEFFEN, ROBERTSON, KIRSTEN
 HECLA MINE SITE/APEX PROJECT # 22201
 (Precision Reference: 890686)

EXTRUSION WELD Precision C#09363

PEEL ADHESION LBS/IN. WIDTH		DESCRIPTION OF FAILURE
	80	
	<u>90</u>	
AVE:	85	Slight Peel at T, Tunnel at edge
SD:	7	Slight Peel at T, Tunnel at edge



APPENDIX G
TECHNICAL SPECIFICATIONS

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SCHEDULE OF QUANTITIES
HDPE LINER SUPPLIERS/INSTALLERS

1.0 INTRODUCTION

1.1 General

The Technical Specifications presented herein are for the work in modifying and the construction of existing and new ponds at Hecla Mining Company's Apex Project near St. George, Utah. These Specifications shall be used in conjunction with the construction Drawings. The ponds shall be constructed to the lines and dimensions shown on the Drawings and comply with these Specifications. Lining of the ponds will include the placement of a leak detection system and associated sump between synthetic liner material.

All earthwork shall be performed to leave a finished grade and surface for liner placement as defined by these Specifications.

Once the earthwork has been approved by the Engineer, the Contractor shall place 60-mil HDPE into the sump and any area requiring placement of liner. Welds must be made so that proper testing can be accomplished. Any tightly spaced welds will be spark tested by the Contractor's quality control (QC) technician.

When the sump liner has been approved, the Contractor will place an eight-inch HDPE monitor pipe within the sump and the sump filled with pea gravel. The monitor pipe shall be situated on top of the HDPE primary layer. Straps made of HDPE material will be welded to the bottom liner at five-ft intervals along the pipe. Placement of Geonet and 60-mil secondary liner shall then be performed in accordance to these Specifications. Field seam testing and final installation quality will be observed by the Engineer prior to approval of the work.

1.2 Inspection of Work

Unless otherwise specified, full-time inspection of all construction activities defined by the Specification will be provided by the Owner. The Owner's inspection of all work shall be performed under the supervision and control of the Engineer or his designated representative while such work is in progress. Said inspections are for the convenience, satisfaction, and benefit of the Owner in determining that the work is performed in strict accordance with these Specifications. It shall be the Contractor's sole responsibility to provide all required materials (both natural and manufactured) and to perform all work in conformance with the Specifications. The Owner's inspections and approvals shall not relieve the Contractor of responsibility for the acceptability of the finished work or portions thereof. All work performed by the Contractor shall be subject to final approval by the Owner and the Engineer, but the detailed manner and method of doing the work shall be under the control of the Contractor.

The Engineer and his representative(s) shall at all times have access to the work whenever it is in preparation or progress. The Contractor shall fully cooperate with the Engineer by providing proper facilities for access and shall furnish labor and equipment reasonably needed for safe and convenient inspection. The Contractor shall give the Engineer ample notice of readiness of the work for inspections, and the Engineer will perform soil inspection in such a manner as not to unnecessarily delay the work.

1.3 Definitions

The following definitions apply to these Specifications:

- a. "Owner is defined as an authorized representative of the Hecla Mining Company; and

- b. "Engineer" is defined as a qualified representative appointed and authorized by the Owner, Steffen Robertson and Kirsten (U.S.), Inc.

2.0 SPECIAL PROVISIONS

2.1 Contractor's Responsibility

The Contractor shall examine these Specifications and Drawings to be aware of all conditions at the site affecting execution of the work. These conditions include, but are not limited to:

- a. Applicable safety and health regulations;
- b. Transportation and access conditions;
- c. Availability of utilities;
- d. Subsoil conditions;
- e. Location, availability, and condition of construction materials; and
- f. Climate and construction conditions at the site.

2.2 Mobilization

Upon receipt of the notice to proceed, the Contractor shall furnish, mobilize, and install such temporary works, materials, equipment, and construction facilities as are necessary for the successful completion of the work. The Contractor shall also operate and maintain such temporary works, equipment, and construction facilities throughout the period of construction. All temporary works, such as sanitation facilities, shall fully comply with the applicable rules and regulations of the governing authorities.

The Contractor shall obtain all necessary permits and permissions to utilize public roads for mobilization, demobilizations, and access to the site. Access to the site is available by use of existing public roads and Owner's roads.

2.3 Schedule of Work

The Contractor shall develop a schedule of work for the Engineer's approval to complete the construction. In no instance shall approval by the Engineer be considered to absolve the Contractor from the responsibility of performing the required work or of protecting the work in interim work stages, or from protecting the work completed prior to final acceptance by the Engineer.

2.4 Disposal of Excavated Materials

Material that may be excavated from the floor of existing ponds or in the construction of new ponds shall be placed in existing lined contaminants at the site or as directed by the Engineer.

Excavated materials that are unsuitable for, or are in excess of, permanent construction requirements shall be wasted. Waste piles shall be located outside the limits of the construction area as approved by the Engineer. Placement will not interfere with the natural flow within storm drainage areas with the operation of the tailings impoundment facilities or other mining structures. They will neither detract from the appearance of the completed project nor interfere with the accessibility of the various parts of the work. Waste piles shall be graded and trimmed to reasonably regular lines and stable slopes.

3.0 ENVIRONMENTAL REQUIREMENTS

3.1 General

The Contractor shall store materials, confine his equipment, and maintain construction operations within the limits of applicable laws, ordinances, permits, or as outlined by the Engineer. Care shall be exercised to avoid blocking roads or in any other way interfering with the Owner's operations, or presenting a hazard to Owner's personnel and equipment, or to the public.

The Contractor shall at all times keep the work site neat, tidy, and free of water materials or rubbish resulting from his work. Fuel, lubricating oils, and chemicals shall be stored and dispensed in such a manner as to prevent or contain spills and prevent said liquids from reaching local streams or groundwater.

3.2 Diversion and Care of Water

The site is in a dry climate area and anticipated to be dry at the time of construction; however, thunderstorms and runoff may occur during the construction period. Depending upon the duration and severity of the thunderstorm, flash floods are possible. It shall be the Contractor's responsibility to protect his equipment and materials, as well as completed or portions of the work in progress from damage in the event of local thunderstorms or flash floods. The Contractor shall provide dewatering, as needed, at his own expense to maintain drained work areas.

The Contractor shall sequence his construction activities to minimize flash flood damage to the earthworks covered under these Specifications. In the event neglect or poor construction planning results in flood damage to the facilities constructed or being constructed, the facilities shall be repaired or replaced to the

4.0 EARTHWORKS

4.1 Liner Base Material

In any areas to receive liner, the soil within one-inch of the surface shall be devoid of any rock fragments greater than 1/4 inch, roots, or any debris, sticks, sharp object capable of puncturing the liner. The final surface shall be compacted to 90 percent of the maximum dry density (ASTM D-698) at less than the optimum moisture content. Compaction shall be performed using only smooth-wheel nonvibratory compactors or Engineer-approved techniques in confined areas. The compacted surface shall be examined prior to liner placement and shall be subject to approval by the Engineer on the day the liner will be installed over the prepared area. The final surface shall also provide a firm, unyielding foundation with no sharp breaks in grade.

4.2 Conduct of Work

The Contractor shall route his construction equipment and take all other actions necessary to prevent material of the type required from being deposited inadvertently, within areas which will adversely impact hydraulic or structural performance. Any improperly deposited material shall be removed from the embankment as required by the Engineer. The material removed should not be reused and shall be wasted in locations designated by the Engineer.

Any stones of such dimensions that would interfere with compaction in the layer thicknesses specified or impact performance, as determined by the Engineer, shall be removed from the zone in which they are placed prior to compaction.

The Contractor shall maintain and protect fills in a condition satisfactory to the Engineer at all times until the final completion

and acceptance of the work. Any approved fill material which becomes unsuitable for any reason whatsoever, after being placed in the fill and before final acceptance of the work, shall be removed and replaced in a manner satisfactory to the Engineer at the Contractor's expense.

4.3 Compaction Equipment

4.3.1 General

The Contractor shall provide sufficient compaction equipment of the types and sizes specified herein as is necessary for the various fill materials specified herein. The Contractor will be permitted to use alternative equipment, provided the Contractor can demonstrate to the Engineer that such equipment will adequately compact the fill material to a density not less than that which would be produced by the equipment specified, and that no undesirable features, such as segregation or stratification, will occur with the proposed alternate equipment. If the Contractor wishes to use alternative equipment, he shall submit to the Engineer for approval complete details of the equipment and the methods proposed for its use. The Engineer's approval of the use of alternative equipment will be conditional upon the Contractor's construction of test fills at his own expense. Any approval of alternate equipment will not relieve the Contractor from responsibility of obtaining the specified compaction.

Tractors used for pulling compaction equipment shall have sufficient power for the most adverse conditions to be encountered during compaction of the fill and when the compaction equipment is ballasted to the maximum weight specified. Compaction equipment shall be maintained in good condition at all times to obtain the maximum degree of

compaction for the equipment being used. The Contractor shall immediately make adjustments to the equipment to achieve optimum results when required by the Engineer.

5.0 SYNTHETIC LINER PLACEMENT

5.1 Scope

The Contractor shall furnish and install synthetic liners and miscellaneous materials incident thereto as specified herein and in accordance with the manufacturer's recommendations. Installation includes excavation and backfilling of synthetic liner anchor trenches as shown on the Drawings. Exact locations and lengths may be varied to suit conditions encountered in the field as approved by the Engineer.

5.2 Conduct of Work

The Contractor shall protect installed synthetic liners in a condition satisfactory to the Engineer at all times until the final completion and acceptance of the work. Any approved installed liners which become damaged or unsuitable for any reason whatsoever before final acceptance of the work shall be removed and replaced by the Contractor at his own expense in a manner satisfactory to the Engineer.

The Contractor shall be responsible for constructing the synthetic liner in an upstream to downstream direction unless otherwise specified or directed by the Engineer. Following synthetic liner placement, no vehicular traffic and minimal installation labor traffic will be permitted on the synthetic liner surface. Special access across the liner, if required, shall be approved by the Engineer.

The Contractor shall demonstrate the method to place liner for the Engineer's approval.

5.3 Materials

The synthetic liner shall be placed over the liner fill to provide an uninterrupted low permeability seepage barrier beneath the impoundment area. Liner materials consist of 60-mil thickness. The liner shall meet the following requirements or as approved by the Engineer:

<u>Tensile Properties</u>		ASTM D638	
1.	Tensile Strength at Yield (pounds/inch width)	Type IV specimen at 2 inches/minute	150
2.	Tensile Strength at Break (pounds/inch width)		250
3.	Elongation at Yield (%)		13
4.	Elongation at Break (%)		750
5.	Modulus of Elasticity (1% secant; pounds/square inch)		90,000
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	Tear Strength (lbs.)	ASTM D1004 Die C	47
	Puncture Resistance (lbs.)	**FTMS 101 C 2031	260
	Hydrostatic Resistance (lbs./square inch)	ASTM D751	495

5.4 Placement

The liner shall be installed by crews with more than five million sq ft experience of the particular type of liner to be installed on projects of similar size and type, according to the manufacturer's recommendations. Experience records of the liner manufacturer and installer shall be submitted to the Engineer for review. Approval of the manufacturer and installer shall be obtained from the Engineer prior to purchase of material or mobilization of the installer.

The Contractor shall visually inspect all delivered liner materials on arrival at the job site for damage and identification. All identification documentation and manufacturer QC reports shall be submitted to the Engineer prior to deployment of liner material.

Any damage to the liner panels caused by shipment, handling, and placement shall be rejected. Liner panels shall remain in the shipping containers or shall be covered and protected from the elements until ready for installation. Only liner panels for each days seaming shall be spread.

The liner panels shall be oriented in such a manner as to minimize stress on the factory and field seams. To this end, liner panels shall be placed with factory seams and long field seams oriented longitudinally with the slopes (positioned up and down slopes).

The liner panels shall be temporarily anchored and held in place with sandbags, or other approved methods until completion of field seaming. Permanent anchoring at the edge of the liner shall be as shown on the Drawings. Care should be taken to ensure that the liner panels are positioned in a slackened condition so that they will conform to the subgrade without being taut when the anchor trench is filled. The liner panels shall be placed and smoothed so that the direct contact with the liner fill is maximized. Cutting of the liner to remove excess material shall be performed. The liner panels shall be positioned in such a way as to prevent excessive wrinkles at the overlaps where field seaming will be completed. No liner shall be placed which cannot be seamed and tested within 24 hours of placement.

5.5 Seaming

Sheets shall be of the maximum width produced by the manufacturer. Before the adoption of a particular seaming technique, the Contractor shall supply the Engineer with written details of the method and equipment to be used. Operating criteria and specifications for the seaming technique and equipment shall be submitted. Approval of the seaming technique shall be obtained from

the Engineer prior to its use. Such approval shall not relieve the Contractor of the responsibility of producing the required seam. Lining sheets shall be seamed by a fusion or extrusion method according to the manufacturer's recommendations.

The two sheets of liner shall be overlapped to the minimum manufacturer's specification with the two sheets pulled tightly to keep the seamed edges smooth and wrinkle-free. If the area to be seamed is not fresh and clean, trichlorethane or other manufacturer-approved cleaner shall be used prior to seaming.

No seaming shall be performed when moisture condensation or precipitation exists at the seam in quantities sufficient to reduce the effectiveness of the seaming technique. No seaming shall be performed if the temperature of the liner material is in excess of 110°F or below 40°F as measured by placing a thermometer in contact with the liner.

5.6 Testing and Field Inspection

The Contractor shall provide the Engineer with a copy of the manufacturer's QC testing for each shipment or partial shipment of liner if the entire shipment is not covered by the testing. Such testing shall include data on the melt index (ASTM D-1238), density (ASTM D-1504), tensile and elongation (ASTM D-638), thickness (ASTM D-1593), and carbon black content (ASTM D-1603).

The test data shall be referenced to a shipment number. Upon placement, the Contractor shall indicate by a plan the exact location at which the liner shipment is installed.

The Contractor shall be responsible for providing his own QC personnel and testing equipment. The Engineer will perform his own testing independent of the Contractor's testing. At the end of each

seam shall be recorded and marked for repair. All repaired areas shall be retested upon completion of the repair. Any hole in the liner sheet shall be patched with no less than a six-inch overlap. Small abrasions shall be repaired with an extrusion bead.

5.6.1 Vacuum Testing

The equipment shall be comprised of the following:

- A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge;
- A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections;
- A rubber pressure/vacuum hose with fittings and connections;
- A bucket and wide paint brush; and
- A soapy solution.

The following procedures shall be followed:

- Energize the vacuum pump and reduce the tank pressure to approximately 5 psi (10 in. of Hg.) (35 kPa) gauge;
- Wet a strip of geomembrane approximately 12 inches by 48 inches (0.3 m by 1.2 m) with the soapy solution;

- A rubber hose with fittings and connections; and
- A sharp hollow needle, or other approved pressure feed device.

The following procedures shall be followed:

- Seal both ends of the seam to be tested;
- Insert needle or other approved pressure feed device into the tunnel created by the fusion weld;
- Insert a protective cushion between the air pump and the geomembrane;
- Energize the air pump to a pressure between 25 and 30 psi (160 and 200 kPa), close valve, and sustain pressure for approximately 10 minutes;
- If loss of pressure exceeds 4 psi (30 kPa) or does not stabilize, locate faulty area and repair in accordance with Section 4.6; and
- Remove needle or other approved pressure feed device and seal.

5.7 As-Built Drawings

Upon completion of the work, the Contractor is responsible to submit not less than three (3) copies of an "as-built" to the Engineer/Owner. The As-Built will illustrate panel layouts, panel numbers, field seam numbers, and destructive sample locations.